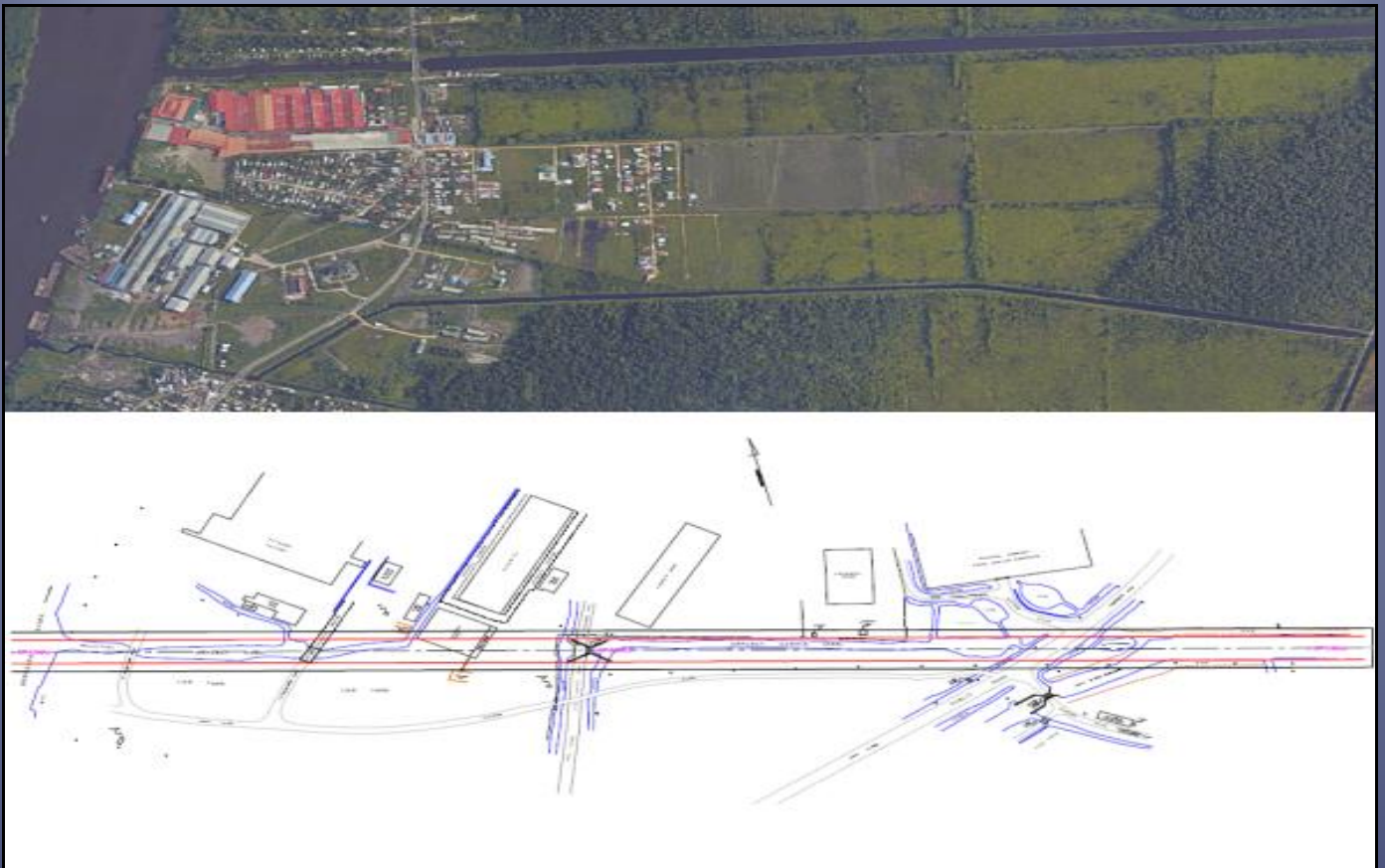


Environmental and Social Assessment Report

Revised

Rehabilitation of Cunha Relief Channel and Structures

The Cunha Relief Channel is one of the emergency spillways of the EDWC, a large and shallow surface water reservoir that supplies irrigation and potable water to the Demerara Mahaica Region. This project is aimed at restoring the capacity of this structure and will eventuate in significant benefits to agriculture and reduction of flood risk. This document provides an Environmental/Social assessment of the proposed works in compliance with the requirements of the GoG and World Bank Safeguards.



January, 2015

Rehabilitation of Cunha Relief Channel and Structures

Environmental and Social Assessment Report

Revised Issue C, January 2015.

Agriculture Sector Development Unit (ASDU)

Ministry of Agriculture

Regent Street and Vlissengen Road

Bourda, Georgetown

Guyana, South America.

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Acronyms

ASDU	Agricultural Sector Development Unit
BCL	Barama Company Limited
BP	Bank Procedures
CAP	Conservancy Adaptation Project
CDC	Civil Defence Commission
CH&PA	Central Housing and Planning Authority
CIDA	Canadian International Development Agency
DFID	Department for International Development
EBD	East Bank Demerara
EDWC	East Demerara Water Conservancy
EIA	Environmental Impact Assessment
EMC	Environmental Management Consultants
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ESA	Environmental and Social Assessment
EU	European Union
GD	Georgetown Datum
GEF	Global Environment Facility
GLSC	Guyana Lands and Surveys Commission
GNBS	Guyana National Bureau of Standards
GoG	Government of Guyana
GPL	Guyana Power and Light Company
GTT	Guyana Telephone and Telegraph Company
GWI	Guyana Water Incorporated
Hydromet	Guyana Hydrometeorological Authority
IDB	Inter-American Development Bank
IS	Implementation Secretariat
IUCN	International Union for Conservation of Nature
LCDS	Low Carbon Development Strategy
LOC	Land of Canaan
LUP	Land Use Policy
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MoHW	Ministry of Housing and Water
MoPWC	Ministry of Public Works and Communications
MoU	Memorandum of Understanding
NDC	Neighbourhood Democratic Council
NDIA	National Drainage and Irrigation Authority
NDS	National Development Strategy
NEAP	National Environmental Action Plan
OP	Operational Policy
PIU	Project Implementation Unit
PPE	Personal Protective Equipment
PS	Permanent Secretary
RDC	Regional Democratic Council
SRD	Sea and River Defence

Executive Summary

The Conservancy Adaptation Project (CAP) was implemented from 2007 to 2013. The project was funded by the Global Environment Facility (GEF) with support from international donor agencies including the Inter-American Development Bank (IDB), United Nations Development Programme (UNDP), Department for International Development (DfID), Canadian International Development Agency (CIDA), United States Agency for International Development (USAID) and the European Union (EU). The implementing agency was the Ministry of Agriculture (MoA) through the Agricultural Sector Development Unit (ASDU).

The purpose of CAP was to reduce flood risk through an improved understanding of the hydrological system of the Coast of Region 4. This would later form the basis for the proposal and design of investments to improve the operation of the Drainage and Irrigation system. The CAP consisted of three (3) components: (i) *Pre-investment studies for engineering design of works*; (ii) *Investments in specific adaptation measures*; and (iii) *Institutional Strengthening and Project Management*. CAP provided a hydrological engineering foundation for flood risk management through which priority investments were identified. Among these is the Cunha Canal Rehabilitation Project aimed at restoring the capacity of an existing relief structure thereby supplementing reservoir emergency spill capacity while improving the drainage of local agricultural areas.

The Cunha Canal is located on the western side of the East Demerara Water Conservancy (EDWC) and discharges into the Demerara River. Discharge from the canal, at the moment, is affected by the high tides and encroachment between the East Bank Demerara (EBD) Public Road and the Demerara River. Around 1990, the Canal was diverted from its original alignment in the vicinity of the EBD Public Road to a smaller discharge channel. This diversion reduced the discharged capacity of the Canal. Sometime later the Canal went into disuse. The discharge through the canal was resuscitated during the floods of 2005. However, the discharge capacity is affected by several factors. The proposed physical works will include the widening of the channel of Canal, the rehabilitation of the former outlet structure, rerouting the canal to its original alignment and construction of a bridge on the EBD Public Road where the canal intercepts the road.

This environmental assessment was guided by the Environmental Protection Agency (EPA) requirements and the World Bank Operational Policies. It aims to address the potential environmental and social issues that may arise from the implementation of the Cunha Canal Rehabilitation Project, in particular, impacts associated with activities during the construction and operational phases. The report proposes specific actions to manage and/or mitigate these impacts prior to the implementation of these physical works.

The Project is categorized as a category B investment under World Bank Environmental Assessment Policy (OP/BP 4.01) as impacts from the project are expected to be moderate in nature. This is due to the fact that the project involves the rehabilitation of existing hydraulic structures in a small area that is dedicated to their operation, already 'highly' disturbed and away from residents; impacts to the biophysical and socio-economic environments will be minimal and insignificant. Five safeguard policies were triggered by the project (i) Environmental Assessment (OP/BP 4.01), (ii) Natural Habitats (OP/BP 4.04), (iii) Physical Cultural Resources (OP/BP 4.11), Involuntary Resettlement (OP/BP 4.12), and Safety of Dams (OP/BP 4.37). These are detailed in section 4.1.6 The World Bank Safeguards Policies.

Potential Environmental and Social Impacts

Construction Phase

The main activities associated with the project during the construction phase are land clearing, earthworks, stockpiling, machine operation and concrete works. These will have the potential to directly or indirectly affect the environment. The potential impacts are loss of land and habitats, pollution of air and water, traffic congestion, displacement and employment related. There is no anticipated loss of livelihood but rather job creation in the short term. These impacts are provided in detail in Section 5 of the report and summarized in Table 1.

Table 1: Summary of potential Environmental and Social Impacts during construction

Conditions	Environmental Impact
Physical Environment	
Environmental Aspect: Land/Soil	
Realignment and widening of the Canal	The loss of land through direct land intake.
Land clearing	Removal of vegetation, where necessary, to facilitate canal widening, re-routing and de-siltation may contribute to erosion.
Operation of machines	Compaction of soil from operation of heavy-duty machines to facilitate widening and de-silting of the canal.
Disposal of materials (sediments and vegetation)	Improper disposal of silt and vegetation from the canal. Improper disposal of vegetation from the embankment as a result of widening the canal.
Storage of fuel and re-fuelling of equipment.	Fuel and/or oil spill from the operation of heavy-duty machines can cause soil contamination.
Environmental Aspect: Emissions to Water	
Fuel spills	Water contamination from fuel/oil spills.
Erosion and Sedimentation	From material stockpiles and excavated materials resulting in discoloration and blockage of drainage system
Waste disposal	Improper solid waste disposal by workers such as food wrappers, boxes etc.

Conditions	Environmental Impact
Environmental Aspect: Emissions to Air	
Operation of heavy-duty machines and equipment	Noise from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge.
Operation of heavy duty machines and equipment	Fumes from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge.
Operation of machines, storage of materials and construction activities	Dust from construction activities, material and waste stockpiles and movement of heavy duty equipment can affect workers and nearby residents.
Biological Environment	
Flora	Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.
Fauna	Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities. Loss of marine diversity is possible but likely to be negligible.
Socio-economic Environment	
Environmental Aspect: Risks in the Working Environment	
Employees' safety can be compromised during the operation of machines.	Employees at risk from accidents and excessive noise from the operation of heavy-duty machines during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge.
Road Safety	Traffic congestion and accidents on the EBD Public Road as a result of bridge construction and storage of construction materials.
Relocation/Displacement	Rerouting of canal through BCL property resulting in loss of land and relocation of some aspect of the operation.
Employment	Overall short-term increase in employment.

Operation Phase

The operational phase of the project will entail activities associated mainly with the maintenance of the channel, embankment and related structures. These activities include periodic de-silting of the canal to remove sediments and weeds and removal of vegetation to maintain the embankments. The potential impacts are risks of accidents to workers and exposure to excessive noise from the operation of heavy-duty machines fuel spills from the operation of machines and continuous habitat disturbance. These impacts are provided in detail in Section 5 of the report and summarized in Table 2.

Table 2: Summary of potential Environmental Impacts during operation

Operational Phase: Maintenance Activities	
Periodic de-silting of the canal to remove sediments and weeds.	Risks of accidents to workers and exposure to excessive noise from the operation of heavy-duty machines.
	Fuel spills from the operation of machines may contaminate water and soil.
Vegetative removal to maintain embankments.	Periodic habitat disturbance.
Flooding	Breaches along the embankment

Management and/or mitigation of the aforementioned potential environmental impacts are provided in significant detail in Section 6.3 of the report. Measures are identified to mitigate the perceived impacts of the project on the environment. These measures should be implemented by the Contractors and monitored by NDIA. The NDIA must ensure Contractors comply with the measures outlined in the Environmental Management Plan (EMP) as detailed in Section 6.

Overall, the major anticipated social impact is associated with traffic disruptions as a result of the bridge construction and relocation of some aspects of BCL Operation; however, these impacts are unavoidable. Given the extent of the works, the fact that the project will be conducted in an already ‘highly’ disturbed area and construction of the bridge and rehabilitation of the sluice will occur in areas away from residents, impacts to the biophysical and socio-economic environments will be limited and can be mitigated.

In summing up Impacts for the type of work anticipated under the project are expected to be moderate in nature and will be managed through the application of appropriate engineering and management measures detailed in this document.

1.0 Introduction

1.1 Background

After the catastrophic flood event of January 2005 a two tier strategy was formulated to reduce to the country's vulnerability to flooding. The first measure involved immediate response actions to restore the system to normalcy and the second was the crafting of a master plan of flood adaptation measures, the Conservancy Adaptation Project (CAP).

CAP would study the system, propose and implement interventions needed to adapt the coast to both the current climatic conditions and the potential adverse effects of climate change thereby reducing the country's vulnerability to flooding. A key component of this project involved modelling and analysis of the hydrologic system to pinpoint critical areas for the prioritization of future investments.

CAP was implemented by MoA through the ASDU and consisted of (3) components: (i) Pre-investment studies for engineering design of works; (ii) Investments in specific adaptation measures; and (iii) Institutional Strengthening and Project Management.

The first component provided the hydrologic baseline essential for designing rational interventions aimed at increasing the current discharge capacity of the coastal drainage and irrigation systems. The key technical achievements under component 1 are as follows:

- Hydrological Data Collection
- LiDAR and Bathymetric Surveys
- Modelling of the EDWC
- *Modeling of coastal lowlands;*
- *Assessment of EDWC dam integrity;*

The second component contributed towards reduction through physical improvements of the conservancy system and the purchase of maintenance equipment. This was supported by GoG funded works that were focused on increasing spill capacity, improvements to embankment dams and internal drainage channels. The interventions executed under component 2 are as follows:

- Widening of key drainage relief canals;
- Improvement of water flow system within EDWC;
- Upgrading of water control structures
- Upgrading of emergency spillways.
- Equipment purchase and installation.

The third was focused on the institutional framework for flood control within the context of the national emergency management sector led by the Civil Defence Commission (CDC). This component also

supported an institutional consolidation of flood control in order to develop and create a consensus around a medium and long term intervention strategy to assist the country to adapt to sea level rise. The achievements of component 3 are as follows:

- *Contingency plan for flood events;*
- *Consolidation of flood control actors;*
- *Monitoring and evaluation of project progress; and*
- *Project management.*

In Summing up CAP provided a hydraulic engineering foundation for flood control planning and management. It lists, prioritizes and details several key drainage regimes for follow on interventions.

1.1.1 Cunha Canal

The Cunha Canal is located on the western side of the EDWC and discharges into the Demerara River. Discharge from the canal, at the moment, is affected by the high tides and encroachment in the vicinity of the EBD Public Road and the Demerara River. Around 1990, the Canal was diverted from its original alignment in the vicinity of the EBD Public Road to a smaller discharge channel. This diversion reduced the discharge capacity of the Canal. Sometime later the Canal went into disuse. The discharge through the canal was resuscitated during the floods of 2005. However, the discharge capacity is affected by several factors. The proposed physical works will include the widening of the channel of the Canal, the rehabilitation of the former outlet structure and construction of a bridge on the EBD Public Road where the canal intercepts the road. The project will result in the Canal returning to its original alignment.

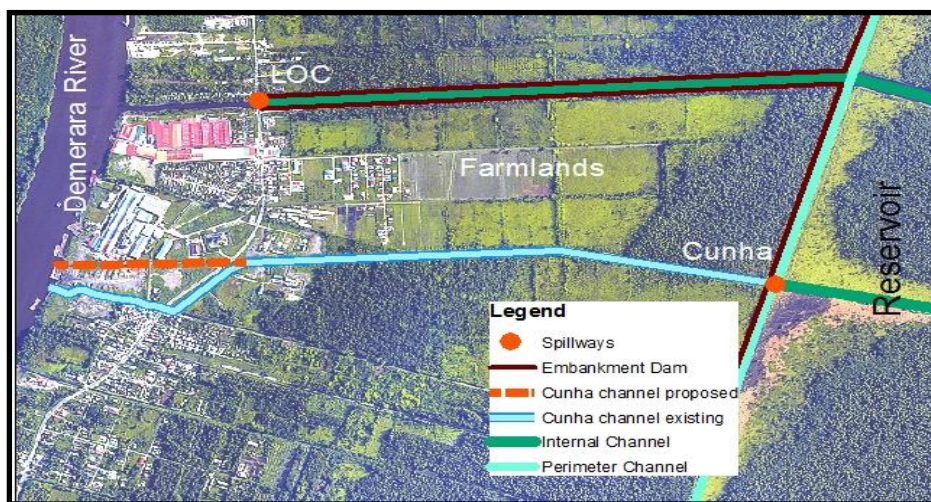


Figure 4: Reinstatement of the Cunha channel to its original alignment

The construction activities, if not properly planned and managed, may have significant impacts on the environment, especially in the Land of Canaan area where the Canal passes. Therefore, the funding agencies (GEF–World Bank) require the conduct of an Environmental and Social Assessment (ESA)

Study to identify any possible environmental and social impacts regarding the execution of this project and to recommend environmental management and mitigation measures prior to the implementation of these physical works.

1.2 Key Timelines

The ESA study was conducted over a period of twelve (12) weeks commencing during the last week of November, 2009 and an ESA report submitted by EMC. It was subsequently revised by the ASDU and a revised report prepared. Table 1 outlines the key timelines associated with the study and the preparation of the assessment report.

Table 3: Key timelines

Date	Activity
November 19, 2009	EMC contracted to prepare the ESA
November 23, 2009	Meeting with EMC and ASDU
November 26, 2009	Initial Site Visit
November 28, 2009	Data Collection
December 05, 2009	Detailed Site Visit
December 15, 2009	Consultation with stakeholders
February 02, 2010	Draft ESA prepared and submitted to ASDU
September 29, 2014	Meeting with ASDU and WB
November 28, 2014	Revised ESA Issue B prepared by ASDU
January 15, 2015	Revised ESA Issue C prepared by ASDU

1.3 Approach and Methodology

The Environmental and Social Assessment Study was guided by the EPA requirements and the World Bank Operational Policies and these are listed below:

- The EPA's guidelines for preparing EMPs and Environmental Impact Assessments (EIAs);
- Environmental Protection Act 1996;
- Environmental Protection Air Quality Regulations 2000;
- Environmental Protection Water Quality Regulations 2000;
- Environmental Protection Noise Management Regulations 2000 ;
- Interim Guidelines for Noise Emissions into the Environment; and,
- World Bank Operational Policy:
 - Operational Policy (OP) 4.01 for Environmental Assessment,

- Bank Procedures (BP) 4.01 for Environmental Assessment,
- OP 4.12 for Involuntary Resettlement,
- BP 4.12 for Involuntary Resettlement.

1.3.1 Methodology

The specific tasks and issues that were addressed during this ESA study, and as highlighted in the Terms of Reference – Appendix A, are described below. The specific tasks include:

- Assemble relevant baseline information on the project area including its geology, soils, hydrology, climate and terrestrial and aquatic flora and fauna;
- Collect information on the socio-economic background of the project area and includes conducting on the ground surveys in the Land of Canaan Area;
- Identify the relevant laws, regulations, standards and guidelines that define the implementation framework of the project;
- Identify, as far as is possible, and assess the biophysical, socio-economic and cumulative impacts of the project;
- Prepare an EMP that recommends measures to address those adverse impacts that can be avoided, or reduced to acceptable levels including plans for monitoring and emergency response during the project implementation phase.

The specific issues associated with the potential project that were addressed include:

- Potential changes or loss of biodiversity due to the construction activities;
- Possible environmental damage due to the storage, use and disposal of fuel, and lubricating oil;
- The potential for soil erosion from rehabilitation and construction activities;
- Impacts of the project on surface and ground water flow;
- The environmental and health issues that may arise from the development of camps/housing for construction workers;
- The environmental and health issues that may arise from the rehabilitation of the drainage channel and the sluice including noise level from equipment and machinery, dust from material stockpile and construction activities, solid waste and other waste disposal, concerns about the health and safety of workers, etc;
- The social, environmental and health issues that may arise from the construction of the bridge including the effect on traffic flow/congestion, dust and erosion from materials stockpiles, storage and handling of fuel, waste disposal, noise from equipment, etc;
- Land use and development issues/conflicts especially potential conflicts with BCL;
- Potential benefits of the project to communities and other stakeholders;

- Environmental monitoring and training requirements for staff; and,
- Emergency response plans.

In order to address the above and to collect the relevant information during the ESA study, a number of approaches were undertaken and these are as follows:

1. Establishing the Baseline and undertaking a Scoping Exercise

Primary data on the physical environment, socio- economic and ecological (marine and terrestrial) environment of the proposed project area were collected. These were determined mainly through site visits, water quality sampling and field investigations to establish the project baseline. Stakeholders were also engaged through interviews and meetings. A list of the stakeholders interviewed is attached as Appendix B.

Secondary data were collected from ASDU and NDIA to provide the background on the project. These include reports, aerial photographs, satellite image assessment, maps and plans and other relevant materials/reports etc.

2. Review of Data, Impact Analysis and Mitigation/Recommendations

The potential impacts of the proposed project were assessed by establishing the interaction between the proposed project activities and the characteristics of the existing environment at the project site and within the effective area of influence.

The potential impacts were examined to determine, qualitatively, the degree and magnitude of the impacts based on the following criteria:

- Direction - positive or negative
- Magnitude - large or small
- Duration - long or short term
- Location - direct or indirect
- Extent - wide or local
- Significance - low or high

The impact analysis for the proposed project activities was divided into two categories: (i) a construction phase; and (ii) an operational phase. The potential impact criteria were applied for specific activities that occurred in each phase of the project.

Recommendations/mitigation measures are proposed to address any potential impact as part of the EMP, as well as, maximising the expected positive impacts. A Monitoring Framework is also included to examine the social and environmental parameters to be monitored during the operation of the project. This Framework is based on the key issues and impacts identified during the study, taking into account the roles and responsibilities of the principal institutions during the operation of the project

1.4 Institutional Arrangement for Project Implementation

CAP was implemented by the GoG through an Implementation Secretariat (IS) and a Project Implementation Unit (PIU). The Cunha canal rehabilitation project will be implemented via this identical institutional arrangement. This arrangement when adapted for Cunha will optimize cost effectiveness and promote a timely execution of the project. Additionally it ensures transparency among stakeholders. The IS has overall responsibility for project oversight and coordination. The PIU is responsible for the day-to-day project administration and implementation. With the MoA as the subject ministry rests the roles of oversight and authority. Grievances from stakeholders will be addressed through existing mechanisms within the ASDU as detailed in section 7.3 Grievance Procedures.

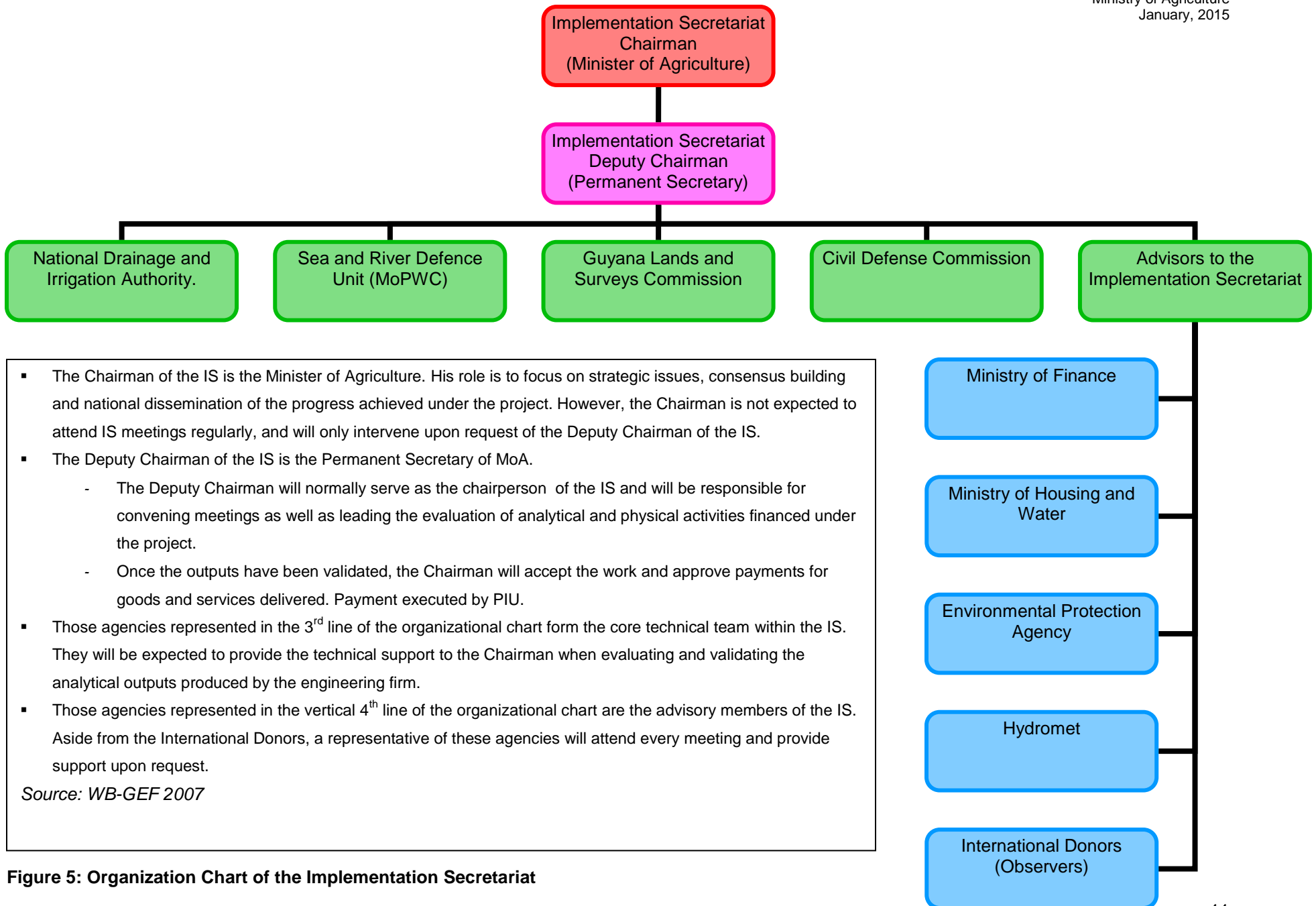
Implementation Secretariat (IS)

The IS comprises of representatives from several governmental institutions and is operational through two (2) levels: (i) core IS; and (ii) advisors to the IS. The core IS, through a Memorandum of Understanding (MoU), comprises of representatives from the NDIA, CDC, Sea and River Defence (SRD) and Guyana Lands and Surveys Commission (GLSC). The advisory members of the IS include representatives from the following institutions: the Ministry of Finance (MoF), Ministry of Housing and Water (MoHW), EPA, Guyana Hydrometeorological Authority (Hydromet) and observers from international donors.

The Minister of Agriculture is Chairperson for the IS and the Permanent Secretary (PS) of MoA is the Deputy Chairperson. Figure 1 provides a graphical representation of the IS.

Project Implementation Unit

The ASDU of MoA will serve as the PIU and manage the day-to-day implementation of the project. The PIU manages among other things, the procurement process, including issuance of the tenders, financial reporting for the project, and payments to the contractors, based on recommendations from the PS of MoA and the IS. ASDU also prepares the bidding documents prior to signing off on projects.



- The Chairman of the IS is the Minister of Agriculture. His role is to focus on strategic issues, consensus building and national dissemination of the progress achieved under the project. However, the Chairman is not expected to attend IS meetings regularly, and will only intervene upon request of the Deputy Chairman of the IS.
 - The Deputy Chairman of the IS is the Permanent Secretary of MoA.
 - The Deputy Chairman will normally serve as the chairperson of the IS and will be responsible for convening meetings as well as leading the evaluation of analytical and physical activities financed under the project.
 - Once the outputs have been validated, the Chairman will accept the work and approve payments for goods and services delivered. Payment executed by PIU.
 - Those agencies represented in the 3rd line of the organizational chart form the core technical team within the IS. They will be expected to provide the technical support to the Chairman when evaluating and validating the analytical outputs produced by the engineering firm.
 - Those agencies represented in the vertical 4th line of the organizational chart are the advisory members of the IS. Aside from the International Donors, a representative of these agencies will attend every meeting and provide support upon request.
- Source: WB-GEF 2007

Figure 5: Organization Chart of the Implementation Secretariat

2.0 Project Description

2.1 Project Location

The Cunha Canal is located at Land of Canaan, EBD between the EDWC and the Demerara River. The Canal commences at the EDWC Western Dam and flows west for 2.8 km to the public road then turns south west towards the Sarah Johanna sluice. After passing through the sluice the Canal then flows through a culvert beneath the public road then west to the Demerara River.

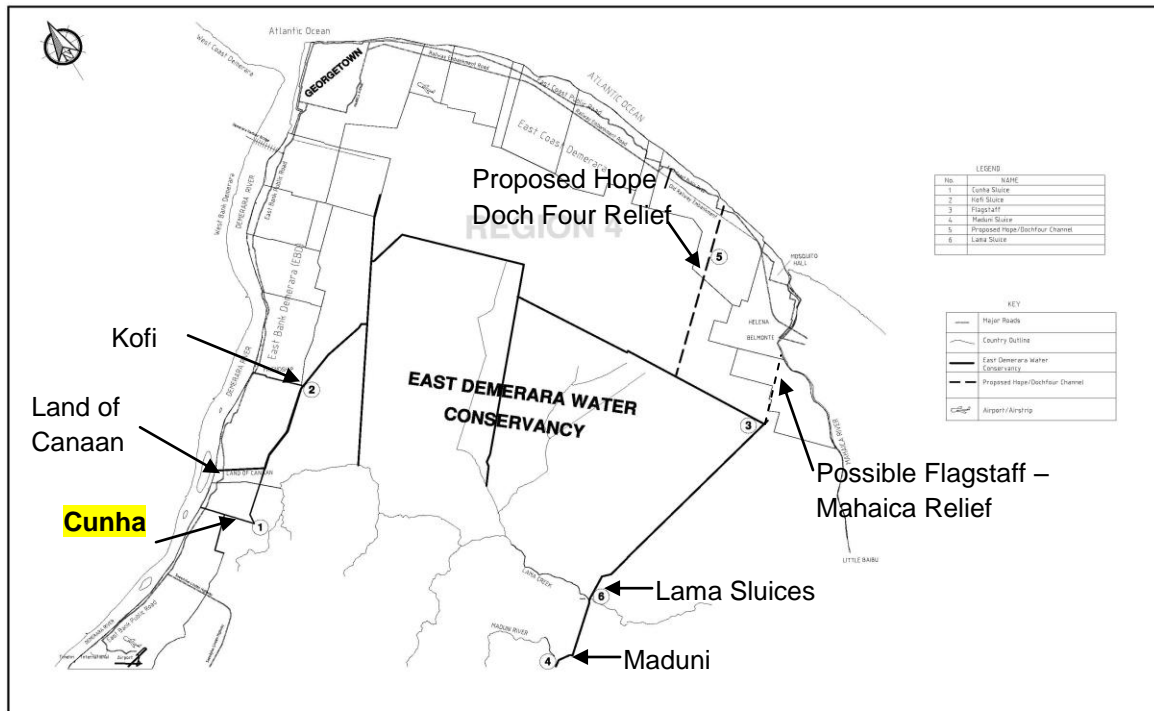


Figure 6: Map showing location of Cunha Canal

(Source: Draft Design of the East Demerara Conservancy Northern Relief: Hope/Doch Four - Hydrological and Hydraulic Modelling Studies)

2.2 Project Background

The EDWC serves the dual purposes of flood control and water supply, and is located to the south of Georgetown in Administrative Region 4. The EDWC is estimated to have a total catchment area of 582 km². The conservancy is formed by an embankment of approximately 60 km long and resting in some areas on very poor ground conditions. The embankment encloses an extensive low lying area that is heavily vegetated. The EDWC has a very flat elevation-area curve. The indication is that at an elevation of 58.5 ft Georgetown Datum (GD), which is considered to be the maximum safe operating water level in the conservancy, the surface area is of the order of 450 km², and that at this elevation the conservancy surface area is 78% of the total catchment area.

During periods of heavy rainfall the water level in the EDWC can raise to unsafe levels. Hence, there is the need for flood relief outlets. Currently there are five (5) such structures and these are the Cunha, Kofi, Maduni, Lama and Land of Canaan. On the western side of the conservancy, Cunha, Land of Canaan, and Kofi, discharge to the Demerara River. On the eastern side of the conservancy the sluices at Lama, and Maduni, discharge to the Mahaica River. During flood conditions Kofi and Cunha are operated with the gates fully open. There is a reluctance to discharge through the Maduni and Lama sluices except in extreme conditions, as discharge through these structures when the Mahaica River is also flooded may exacerbate flooding from both the Mahaica and the Mahaicony Rivers. The Land of Canaan gates are also lifted clear of the water during flood conditions.

During January of 2005, the coastal regions of Guyana experienced prolonged and extremely heavy rainfall that resulted in serious flooding in Georgetown, and along the coastal area especially in Region 4. The EDWC embankment overtopped at some locations and there was considerable concern about the safety of several sections of the embankment. The peak conservancy water level recorded in January 2005 at Flagstaff was 58.80 ft GD. Interestingly, in every year since 2005, the maximum water level at Flagstaff and at Lama has exceeded 58.50 ft GD, the perceived safe maximum water level for the EDWC. Given this situation, it was determined that there is the need for an additional discharge capacity for the EDWC. A new channel from the Conservancy leading directly to the Atlantic Ocean is currently under construction so as to not affect the drainage system in other areas such as the Mahaica River. Increasing the capacity and efficiency of the existing drainage structures was also considered and hence it was decided that the Cunha Canal should be rehabilitated. Rehabilitation of the Canal would increase its discharge capacity and contribute to the reduction of the risk of overtopping of the embankment and flooding of areas along the East Coast of Demerara.

2.3 Current Situation

The total length of the Cunha outfall is 2.8 km. There are two sluices in the channel: one at the conservancy and the other at the EBD Public Road. The structure at the EDWC is a vertical lift gate sluice as shown in Figure 4B. The gate is adjustable and the base slabs through the structures are flat with no raised sill. At the downstream end of the channel there is a tidal sluice which is usually closed at high tide. This sluice is a concrete structure which has two (2) small gates which open and close to control the flow of water. Immediately downstream of the sluice, culverts carry the channel beneath the road to a further short open channel which finally discharges into the Demerara River.

The Cunha Canal is thought to be constructed around the same time as the EDWC, over one hundred and forty (140) years ago. The Canal was used to release excess water from the EDWC throughout the years. However, the Canal had apparently fallen into disuse after construction of the five door sluice at

Land of Canaan (LOC). In addition, the discharge channel of the Canal in the vicinity of the Public Road was altered with the establishment of BCL Plywood and Sawmilling operations. Previously, the Canal flowed straight to the Demerara River through a sluice which was located along the Old Public Road. However, this area was sold to the Company around 1990 and the Canal was subsequently diverted south west along the new EBD Public Road and then through a sluice located between Land of Canaan and Sarah Johanna. The Canal was brought back into use following the 2005 floods when some rehabilitation works were done. The current situation is presented in Figure 4.

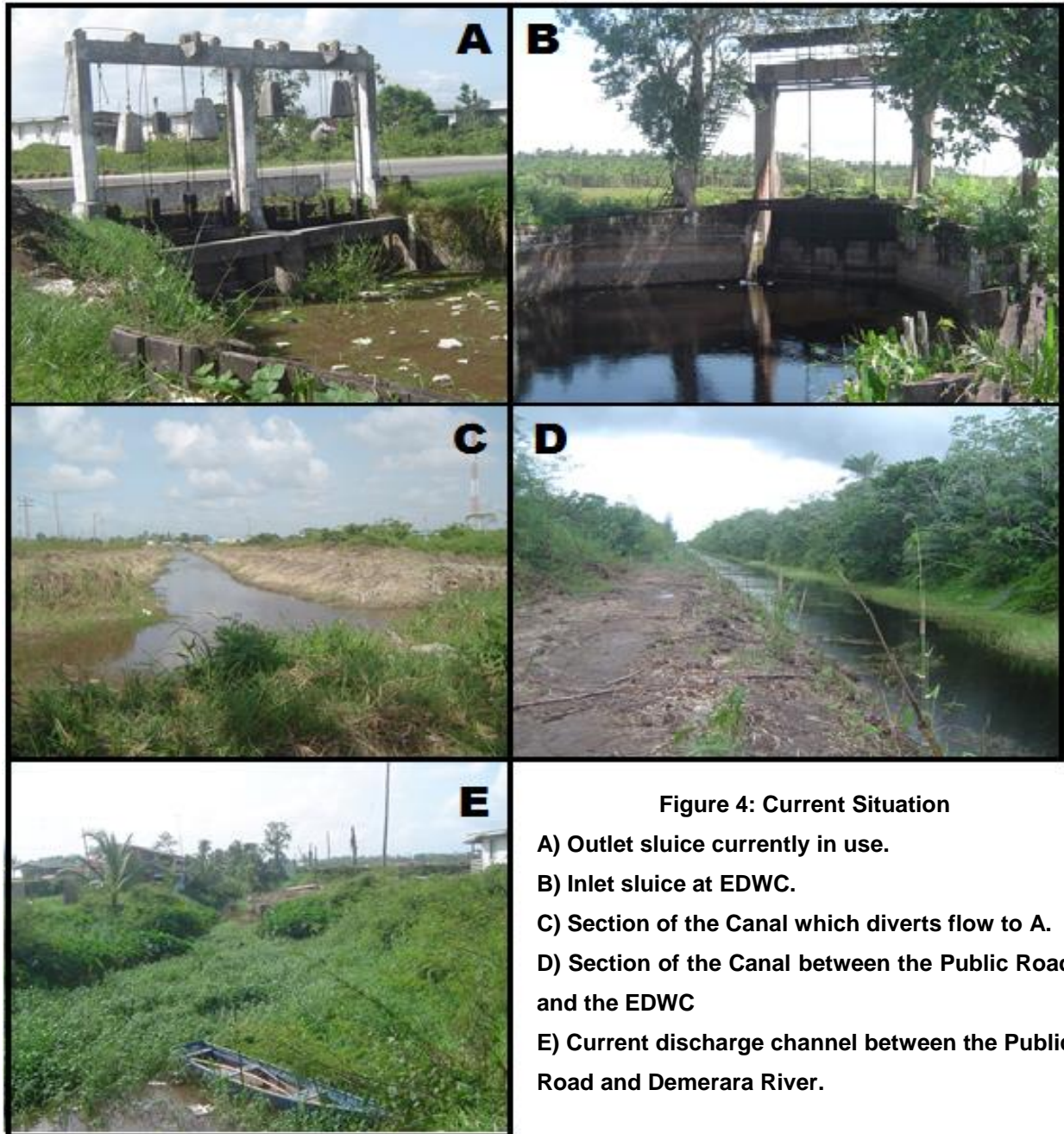


Figure 4: Current Situation

- A) Outlet sluice currently in use.**
- B) Inlet sluice at EDWC.**
- C) Section of the Canal which diverts flow to A.**
- D) Section of the Canal between the Public Road and the EDWC**
- E) Current discharge channel between the Public Road and Demerara River.**

The efficiency and discharge capacity of the existing alignment of the canal is affected by several factors as outlined below:

- The flow of the channel has been significantly reduced due to sedimentation and growth of vegetation both upstream and downstream of the EBD Public Road;
- The diversion of the Canal from its previous straight alignment resulted in two (2) almost 90 degrees turns which contributes to a decrease in water flow;
- There is a further restriction to the flow upstream of this sluice resulting from a road culvert over the channel; and
- The sluice gate at the Public Road is not fully operational. The gate does not open clear of the water. This will further restrict flow out of the channel to the Demerara River.

2.4. Project Activities

2.4.1 Construction Phase

Rehabilitation of the Canal will alleviate the problems identified above and will result in a more efficient functioning of the discharge system. The works to enhance the discharge capacity of the Canal will include the following:

- De-silting and widening of the current drainage channel.
The existing channel will be widened and the canal will be excavated to remove the build-up of sediments and weeds. The canal will be widened to 66.6 feet with a total way leave of 101.2 feet including embankments. A cross section of the proposed canal is attached as Appendix C.
- Rerouting the canal to its original alignment.
The Canal will be rerouted to its original alignment which will allow for a straight flow into the Demerara River. In this regard, the Canal will pass through BCL property.
- Rehabilitation the old sluice to prevent inflow of river water during high tides.
Previously, this sluice was used to control the discharge of water and to prevent river water from entering the canal during high tide. Due to the aforementioned changes to the Cunha Canal it becomes necessary to rehabilitate this sluice. Drawings of the sluice are attached as Appendix D.
- Construction of a bridge across the EBD Public Road.
A new bridge will be constructed at the point where the canal will intercept the EBD Public Road to allow vehicular traffic to traverse the area. Drawings of the bridge are attached as Appendix E.

The restoration of the defunct realignment of the channel to its original alignment will address these inefficiencies. A map of the existing and proposed alignment of the channel is shown in Figure 5.

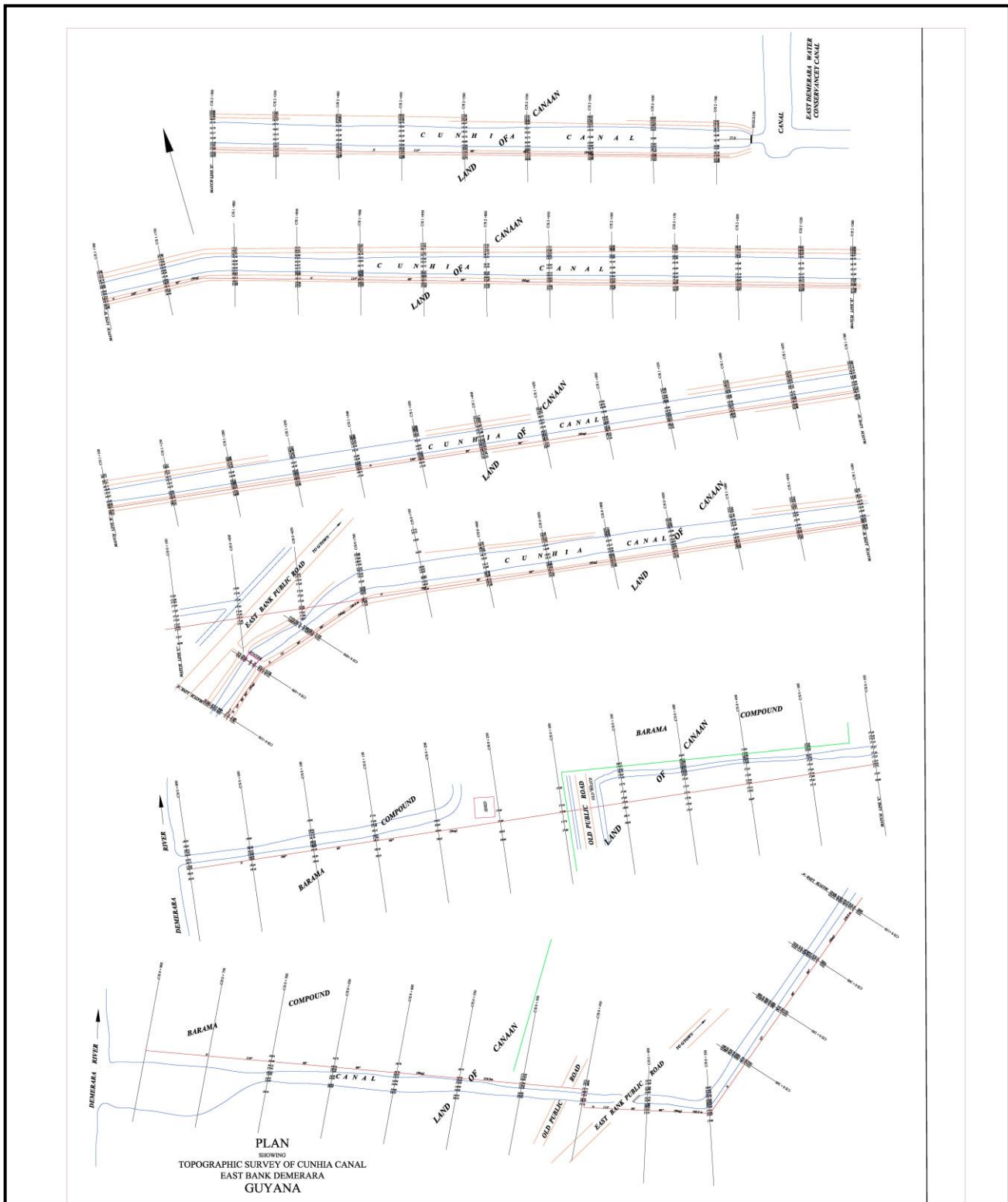


Figure 5: Map showing the current and proposed alignment of the Cunha Canal

2.4.2 Operational Phase

The Cunha Canal will be operated and maintained by the NDIA during its operational phase. The Canal will be used primarily to discharge excess water from the EDWC to the Demerara River. It is expected that some five hundred (500) cusecs of water will be discharged. Some maintenance activities will be done during this phase to ensure the discharge capacity is maintained and include periodic de-silting and clearing of vegetation.

2.5 Project Benefits

During January of 2005, the coastal regions of Guyana experienced prolonged and extremely heavy rainfall that resulted in serious flooding in Georgetown, and many areas along the East Coast Demerara. The entire population along the impacted coastal regions was affected. Moreover, flood damages resulted in significant economic losses.

Flood assessments noted that the EDWC embankment overtopped, thus, raising considerable concerns about the safety of several sections of the dam. Therefore, widening and straightening of the Cunha Canal will contribute to additional discharge capacity for the EDWC during periods of excessive rainfall. This will in turn reduce the risks associated with overtopping and breaches to the dam and the subsequent flooding that can result to affect the surrounding population.

The Neighbourhood Democratic Council (NDC) is very supportive of this project. During consultation they indicated that the project would also contribute to the reduction of flooding within the immediate and adjoining areas. It will benefit local communities in Kuru Kururu that depend on drainage through the Cunha Canal, and villages on the East Bank of Demerara (EBD) that depend on drainage through the Sarah Johanna sluice.

3.0 Project Environment

3.1 Geographical Location

The project is located within Guyana's Coastal Plain at LOC in the Administrative Region No. 4. LOC is located on the right bank of the Demerara River, approximately 20 kilometers upstream from the mouth of the river. The coastal area consists of a combination of natural and man-made sea defence structures, mud banks, mangrove forests and sand flats, all of which serve to protect the coast from inundation and flooding. The Canal is located in the area west of the EDWC between the Conservancy Dam and the Demerara River.

Immediately south of the Canal are lands owned by BCL. Currently, most of these lands east of the Public Road are not being utilised. Housing facilities for the employees of BCL, as well as a plywood retailing outlet, are located in close proximity to the Public Road. North of the Canal and, closer to the Conservancy are lands covered with vegetation followed by a newly constructed private residential housing scheme. West of the Public Road the Canal will flow along its previous alignment to the sluice structure to be rehabilitated. The canal will then pass through the compound of BCL to the Demerara River.

3.2 Physical Environment

3.2.1 Soils and Geomorphology

The topography of the Canal area is typically low-lying and flat. The soils of the area are a combination of Demerara clays, white sand, and pegasse towards the Conservancy Dam. Since the site is located on the Coastal Plain of Guyana where soils are characterised by four different types of clays Mara Clay, Brickery Clay, Tuschen Clay and Lama Muck a combination of the following is expected:

Mara Clay: Poorly drained soil developed from relatively old marine sediments. It occurs in depressions and is characterized by a shallow peat deposit over thick grey clay underlain by greenish grey clay subsoil.

Brickery Clay: Poorly drained soil developed in river alluvium. The alluvium may have been deposited over fluvio-marine sediments. It is characterized by a thin dark grey surface over grey clay subsoil mottled with brownish yellow, yellow red and brown. The substratum is soft green grey clay, which may contain numerous bits of partially decomposed organic matter. The soil is strongly acid, slowly permeable and has a moderate level of fertility.

Tuschen Clay: Poorly drained soil developed in river alluvium. It is characterized by a thin dark grey clay surface over a grey to greenish clay subsoil with mottles of brownish yellow, yellowish red and brown. The soil is strongly acid, slowly permeable and has a moderate level of fertility.

Lama Muck: Poorly drained organic soil occurring in depressional areas. The soil consists of well decomposed muck underlain by dark reddish brown peat. The substratum is greenish grey soft clay.

3.2.2 Fluvial Geomorphology

On average, the Demerara River navigable channel width decreases in the vicinity of Land of Canaan but sufficient to facilitate passage and moorage of river vessels. The flow of the river is unidirectional, being north, north-west towards the Atlantic Ocean. On a more localized scale some more oblique currents may obtain resulting in bank erosion and/or deposition. The river appears to transport large volumes of sediment and minor erosion may be expected when the river is in spate. The right bank on which the project site is located, appears to be stable, and not prone to active erosion as there is approximately 100 metres of revetment by BCL and presence of stabilising vegetation along with deposition along this bank.

Sustained high levels of turbidity are notable for the Demerara River from observations. In the absence of long term monitoring data it is difficult to determine the reason for these high turbidity levels. There are no flow discharge data available for the Demerara River.

3.2.3 Geology

The area is underlain by migmatites (younger granites). The granite bedrock is overlain by quaternary marine clays. Modern fluvial deposits associated with the Demerara overlie these deposits. This alluvium appears to have high clay content.

3.2.4 Hydrology and Drainage

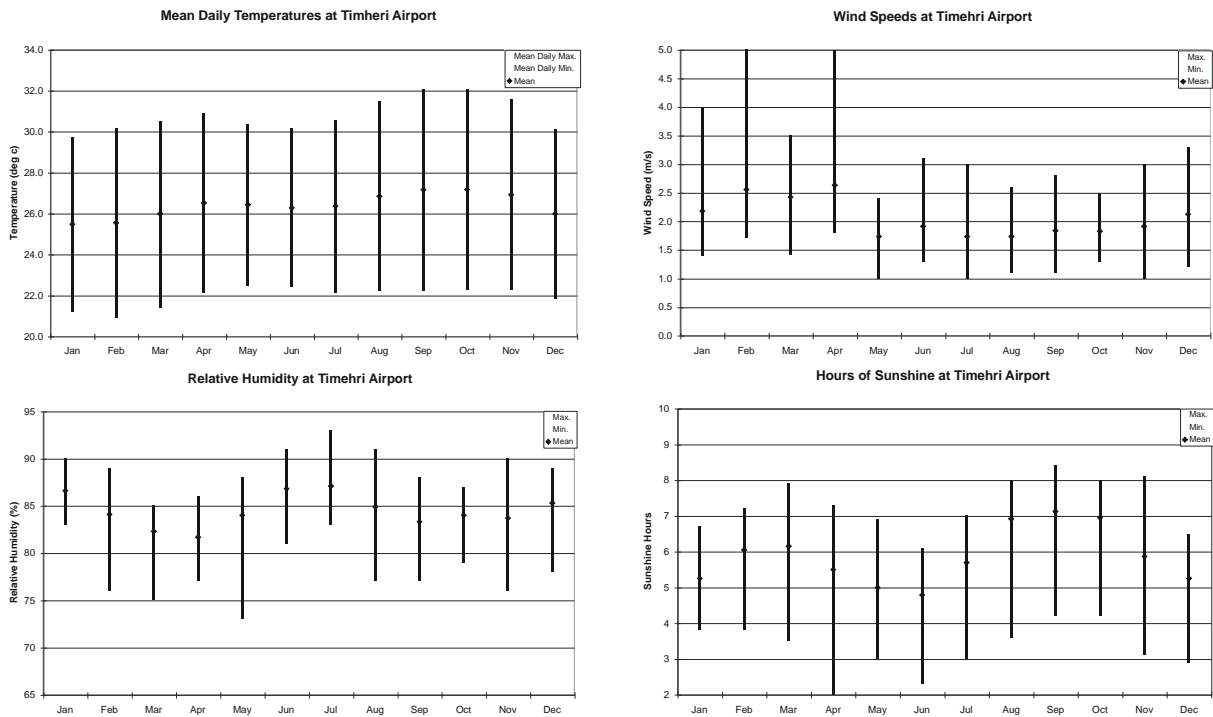
The hydrology of the site is largely controlled by its situation in the lower floodplain of the Demerara. The soils within the general area are likely to be clay rich, with poor internal drainage. Much of the drainage in the general area of the EBD is done by canals which empty into the Demerara River and is regulated by sluices. The pattern of settlement along EBD resulted in the construction of numerous drainage ditches which lead into these main canals. There is a drain to the north of BCL Land of Canaan Complex which drains to the Demerara River. The Cunha Canal is located to the south. The NDC and Regional Democratic Council (RDC) share responsibility for the operation and maintenance of the canal and sluice.

3.2.5 Climate

The project site falls within the coastal plain which is characterized by two wet seasons from April to July, and November to January and two dry seasons in between. Daily temperatures range between 25-32 °C and are influenced by the northeast tradewinds. Annual rainfall is approximately 2000-2500 mm. Wind speed in generally 1.5 to 2.5 mph in east to north east direction.

There are no weather stations in the LOC area, the closest being the Hydromet Station at Timehri, approximately 8 miles from the project site. Meteorological data from the station for the years 1991 – 2002 is presented in Table 4. The variance of this data to conditions at the project site is not expected to be significant based on the close proximity.

Table 4: Meteorological data from the station for the years 1991 – 2002



3.2.6 Water Quality

It is expected that the water quality within the Cunha Canal will change from time to time, depending on the activity of the Canal. When water is being discharged, the entire Canal should be filled with dark brown water found in the EDWC. However, when the Canal is not discharging the water quality may vary. At the time of the site visit, it was observed that the water in the Canal closer to the inlet sluice was dark brown. However, closer to the Public Road and the Demerara River, discolouration was observed due to the presence of sediments from runoff. There is also the possibility of salt water intrusion into the Canal during high tides in the Demerara River. During the site visit, two (2) water samples were collected. These samples were analysed for various parameters. The results of the parameters are outlined in the Table 5 below. It should be noted that these samples were collected after a period of brief rainfall.

Table 5: Results from the Water Quality Analysis

Sample ID		SW1	SW2
Location Description		Cunha Canal closer to EDWC	Cunha Canal closer to Public Road
Date Sampled		Dec 05, 2009	Dec 05, 2009
Parameters	pH	3.6	3.76
	EC _w	0.04	0.28
	DO	6.49	5.63
	TDS	40	152
	TSS	ND	72
	SO ⁴	3.43	4.84
	O&G	0.48	0.07
	Cu	0.01	0.01
	Fe	1.53	2.61
	Al	1.8	9.61
Zn	ND	0.01	

Key

DO - Dissolved Oxygen TDS - Total Dissolved Solids TSS - Total Suspended Solids
 Cu – Copper Fe – Iron Al – Aluminum
 O&G - Oil & Grease ND –Not Detected

As observed from the results the parameters were generally within acceptable limits. There was also no major difference in the general water quality between the sample locations.

3.3 Biological Environment

Guyana is subdivided into three major bio-geographical provinces (Guyana/UNEP, 1992), namely the coastal bio-geographical province, the savannah province and the forest bio-geographical province. According to the National Biodiversity Action Plan 11, a significant part of the Guyana biodiversity exists on the coastal zone, though most of it is located within the forest and savannah provinces. The Cunha Canal is located within the coastal bio-geological province of Guyana.

The stretch of Canal from the EDWC to the Demerara River is characterized by secondary growth vegetation, indicative of an area that is highly disturbed. The Canal may be subdivided into two vegetation realms based on existing vegetation. The East Bank Road end, along the original route of the Canal from the Public Road to the Demerara River, is now overgrown with 'common weeds', Carrion crow bush and Congo Pump vegetation. From the East Bank Road to the EDWC along the Canal embankments the vegetation starts predominately with Bamboo trees with sparse spots of Moko Moko, Conga Pump, Clammy Cheery, etc., and progresses sharply into tree type vegetation reflective of the swamp vegetation of the EDWC. Aquatic vegetation within the Canal was sparse, and consisted typically of water lilies, moss and dew grass throughout the entire stretch of the Canal towards the EDWC.

Faunal diversity at the site was sparse as compared with other areas of the Coast and may be a reflection of the high disturbance events, such as canal cleaning by bulldozers that continuously occurs at the site. There were no endangered species or sensitive habitats found at the site. Commonly observed fauna in the area were butterflies, wasps, beetles, birds such as the kiskadee, dove, yellow plantain, etc. Domesticated animals such as cows, sheep, goats, etc. also exist, utilising open grazing ground at the site. The Drainage and Irrigation Act prohibits the access and use of irrigation infrastructure such as dams for these activities; however there is a challenge of enforcement due to the area being large and isolated. The Cunha Canal is reported to contain fishes such as hassar, houri, patwa, lukanani, sunfish, and reptiles and amphibians including caimans, snakes, lizards, and crapauds.

To determine the floral and faunal characterization of the Canal and embankments and areas of the original route of the Canal, a rapid assessment primarily done through visual encounter surveys and interviews was conducted. The rapid assessment was supplemented by a review of literature on the area (Coastal) biodiversity.

3.3.1 Flora

Along the Cunha Canal and embankments and along areas of the original canal route the vegetation comprises of secondary 'disturbed' vegetation, primarily of common weeds, shrubs, herbaceous plants

and trees. Species found at the site are very common and can be found throughout the Coastal Plain. Species such as the tree types and grasses found along the Canal embankments are important for embankment stability and act as a 'prevention mechanism' against soil erosion. These species also provide a habitat for many faunal species serving as roosting and breeding sites for birds, insects and other fauna. As a consequence, it is crucial that proposed works are done in a manner to allow natural re-vegetation of these species or ensure that re-vegetation is done along the embankments after works. As indicated earlier none of the species identified were endangered or were on the IUCN species listings. The Table 6 lists the plant species encountered at the Cunha Canal and embankments and the areas along the original Canal route.

Table 6: Plant species found in the project area

Family/Common Name	Species Name	Frequency/comments
POACEAE		
Burr grass	<i>Cechrus echinatus</i>	Very common at the site
Carpet grass	<i>Axonopus compressus</i>	Very common
Bahama grass	<i>Cynodon dactylon</i>	Very common
Bird seed grass	<i>Echinochloa colonum</i>	Very common
Bamboo grass	<i>Hymenachne amplexicaulis</i>	Common
Jew grass	<i>Imperata brasiliensis</i>	Common within Canal at transition area at EDWC
Razor grass	<i>Paspalum virgatum</i>	Common
Elephant grass	<i>Pennisetum purpureum</i>	Common
CAESALPINIACEAE		
Carrion crow bush	<i>Cassia alata</i>	Very common
Money bush	<i>Cassia obtusifolia</i>	Very common
Wild coffee	<i>Cassia occidentalis</i>	Common
FABACEAE		
Shak-Shak	<i>Crotalaria incana</i>	Common
Sweet heart/Watch man	<i>Desmodium frutescens</i>	Common
HELICONIACEAE		
Heliconia	<i>Heliconia psittacirum</i>	Common along Canal Embankment
PONTEDERIACEAE		
Water hyacinth	<i>Eichhornia crassipes</i>	Common
MIMOSACEAE		
Giant shame bush	<i>Mimosa pigra</i>	Common at East Bank road end
Shame bush/Goat plimpla	<i>Mimosa pudica</i>	Common at East Bank road end

Family/Common Name	Species Name	Frequency/comments
ARACEAE		
Moko Moko	<i>Montrichardia arborescens</i>	Common through out the proposed project area
NYMPHACEAE		
Water lilly	<i>Nelumbium nelumbo</i>	Common within Canal
SPHENOCLEACEAE		
Soap bush	<i>Sphenoclea zeylancia</i>	Common
POLYPODIACEAE		
Hasar/Fern	<i>Nephrolepis multiflora</i>	Common on Canal embankment at transition area at EDWC
CECROPIACEAE		
Conga pump	<i>Cecropia sp.</i>	Very common on Canal Embankments
MYRTACEAE		
Jamoon	<i>Syzygium cumini</i>	Sparse on Canal embankments
BORAGINAAECEAE		
Clammy Cherry	<i>Cordia tetrandia</i>	Common on Canal Embankments
Bamboo		Very common on Canal Embankments
Manicole	<i>Euterpe oleracea</i>	Sparse on Canal embankments
Whitey		Common on Canal Embankments
Etae		Common on Canal Embankments
BIGNONIACEAE		
White Cedar	<i>Tabebuia insignis</i>	Sparse on Canal embankments

3.3.2 Fauna

Fauna

Fauna observed is typical of areas where human disturbances are frequent. Like the flora, the fauna are very common and can be found throughout the Coastal Plain especially on abandoned and open lands. Even though common within the coastal realm, faunal diversity in the area is sparse primarily due to heavy habitat disturbance. However, faunal diversity observed at the site consisted primarily of highly mobile species that adapts easily to changing environments. Species observed are nevertheless confined to micro habitats fragmented by urban structures such as the East Bank Road, the Cunha and other

Canals, housing communities, etc. Most avian species observed were transient, with a home range spanning the project site.

There were no endangered species noted at the site and none of the species identified were listed on the IUCN species listings or restricted by the CITIES listings. Habitat loss will be the major impact on faunal diversity. In its present condition, existing micro habitats are severely stressed by human activity. As such, it is crucial that habitat destruction is minimized and that proposed works are done in a manner that allows natural regeneration/resuscitation of habitats and/or to ensure that re-vegetation is done along embankments and contiguous areas after works are completed. Table 7 provides a list of the predominant species observed in the area.

Table 7: Faunal species found in the project area

Family/Common Name	Species Name
Birds	
COLUMBINIDAE	
Dove	<i>Columbina passerine</i>
ARDEIDAE	
Great Egret	<i>Egretta alba</i>
ICTERIDAE	
Yellow Plantain	<i>Icterus nigrogularis</i>
Carib Grackle	<i>Quiscalus lugubris</i>
TROCHILIDAE	
Spectacled Hummingbird	<i>Schistos geofforyi</i>
TUDIDAE	
Cocoa Thrush	<i>Turdus fumigatus</i>
TYRANNIDAE	
Kiskadee	<i>Pitambus sulphuratus</i>
JACANIDAE	
Spurwing	<i>Jacana jacana</i>
THRAUPIDAE	
Peezing	<i>Volatinia jacarina</i>
TURDIDAE	
Cocoa Thrush	<i>Turdus fumigatus</i>
Fishes	
CICHLIDAE	

Family/Common Name	Species Name
Patwa	<i>Cichlosoma bimaculata</i>
Sunfish	<i>Grenicichla alata</i>
Lukanani	<i>Cichla ocellaris</i>
ERYTHRINIDAE	
Huri	<i>Hoplias malabaricus</i>
PIMELODINAE	
Kasi	<i>Rhamdia quelen</i>
SIMORIDAE	
Hassar	<i>Hoplosternum littorale</i>
Silverbait	<i>Astanyax sp</i>
Amphibians	
BUFONIDAE	
Crapaud	<i>Bufo marinus</i>
Reptiles	
CROCODYLIDAE	
Caiman	<i>Caiman crocodylus</i>
TEIIDAE	
Salipenta	<i>Tupinambus tebuixin</i>
TROPIDURIDAE	
Lizard	<i>Trapidorus hisperus</i>
VIPERIDAE	
Labaria Snake	<i>Bothrops atrox</i>
Invertebrates	
DIPTERA Flies, Mosquito	
HYMENOPTERA Ants	
LEPIDOPTERA Butterflies	

Faunal diversity at the site is sparse as compared with other areas of the Coast and may be a reflection of high human disturbances within the area. Further, faunal diversity is comparatively richer in the swampy savannah area and the Mangrove Foreshore area as a result of less human interaction.

The project site including the savannah swamp lands areas are highly disturbed environs with significant amounts of habitat loss/stress already experienced as a result of human interactions/encroachment. As a consequence, the existing biological realm of the area is predominated by species that adapts well to

changing environments. It is therefore expected that there will be a rapid recovery of habitats and associated biodiversity owing to species adaptability to the habitat stresses that will ensue from proposed project works. However, this scenario assumes that appropriate mitigation to negate impacts associated with the proposed development will be implemented.

3.4 Socio-Economic Environment

3.4.1 Population and Demographic

The project site falls within the jurisdiction of the Caledonia-Good Success Neighbourhood Democratic Council (NDC) which has a population of approximately 25 000. There is no recent data on the population of the Land of Canaan community. However, taking into consideration that there are approximately 2 500 houses and based on the theory that there are approximately 5 persons per household it is estimated that the community's population is approximately 12 500 (sourced from the Caledonia-Good Success NDC).

3.4.2 Existing Land Use and Zoning

Most of the villages within the Caledonia-Good Success jurisdiction were once plantation lands where agriculture and chicken farms were an important aspect of village livelihood. At present there is no existing zoning plans for villages within the NDC District, including Land of Canaan to determine whether the village is principally residential, commercial, industrial or a combination of these. The present pattern of land use suggests a combination of the residential, industrial and commercial use. The CH&PA having overall responsibilities for planning permission has indicated that it is moving in the direction of preparing Rural Development Plans and a project focused on this is currently underway. However, Land of Canaan is one of the communities where there is significant industrial and commercial development. Principal amongst these are:

- Gafoor's general hardware and construction complex
- CariAir/Roop Group Packaging Facility
- Two Brother's Service Station
- Barama Company Limited

The main economic activities in the area are from small, medium and large scale businesses and to some extent agriculture including poultry and cash crop farming. There are also a number of forestry related operations including sawmill, wood processing operations and lumberyards. Many persons residing within Land of Canaan as shown in Figure 6 are employed at BCL.

A private residential housing scheme is currently being constructed in the Land of Canaan area, just north of the Cunha Canal.



Figure 6: BCL housing facilities east of the Public Road on both sides of the Canal

It should be noted that another major relief channel for the EDWC, the Land of Canaan Canal is in close proximity to the Cunha Canal.

3.4.3 Social Infrastructure

The present utilities and services within Land of Canaan include:

- Electricity (GPL)
- Water (GWI)
- Phones (GT&T)
- Roads (the NDC is responsible for repairing all internal streets & roads while the Ministry of Public Works and Communications (MoPWC) is responsible for the East Bank Highway)

The NDC holds responsibility for maintaining parapets, drains, and outfall trenches. Street lights are strategically placed throughout the NDC area and work for twelve hours each day. The NDC pay the bill for street lights situated only on internal roads and streets.

Within Land of Canaan there are no health facilities. However, within the NDC District, two Health Centres exist at Craig and Supply Villages.

Garbage collection is not provided by the NDC but a private disposal service collects garbage once a week in Land of Canaan for a cost of \$200 per house while some residents dispose of their garbage by burning.

3.4.4 Road Traffic

The EBD Public Road facilitates a high volume of traffic. These include traffic to and from the Cheddi Jagan International Airport Timehri, the town of Linden and the interior locations of Guyana. Vehicular traffic includes cars, minibuses, 4*4 vehicles, etc. A significant amount of heavy vehicles in the form of sand trucks also traverse this roadway on a daily basis. In the vicinity of the project area, given that residents are not in close proximity, pedestrian traffic is extremely low. Also, in this area, the presence of animal drawn transportation is limited.

4.0 Policy, Legislative and Institutional Framework

4.1 Policies

4.1.1 Constitution

The need for a national environmental policy for Guyana has its foundations within the 1980 Constitution in Articles 2:25 and 2:36.

Article 2:25 of the Constitution states that *“every citizen has a duty to participate in activities to improve the environment and protect the health of the nation”*. And Article 2:36 states that *“in the interest of the present and future generations the state will protect rational use of its flora and fauna and will take all appropriate measures to conserve and improve the environment”*.

4.1.2 National Development Strategy (2001-2010)

The Government of Guyana’s policy commitment to environmental management and sustainable development is emphasized in the National Development Strategy (NDS). The NDS supports an accelerated growth process involving the participation of the wider society, as well as, defining the need for environmental protection to be treated as a cross-sectoral issue applied to all aspects of the development process.

4.1.3 National Environmental Action Plan (NEAP)

The GoG’s environmental policy was first identified within the National Environmental Action Plan (NEAP) (1994). The plan presented a 12-point National Environmental Policy reflecting sound principles of environmental management and the ideal of sustainable development. A programme of action over a 3-year period was identified to address priority environmental issues.

The second NEAP (2001-2005) is a continuation of NEAP (1994), setting out the “*environmental development strategy for Guyana for the next five years*” and “*a framework for integrating cross-sectoral environmental concerns in the broader context of the country’s economic and social development programme*”. The Action Plan outlines a further commitment to sustainable development and a thematic approach to environmental protection. The implementation strategy for NEAP involves the identification of programme areas according to sectors and cross-sectors and tools and actions for implementation.

4.1.4 National Land Use Policy (LUP)

The National Land Use Policy (LUP) aims to streamline land use planning and to create conditions necessary to achieve types of land uses which are sustainable, socially desirable and environmentally compatible. The LUP and the National Land Use Plan are prepared by GL&SC.

The Commission aims to also prepare regional plans for specific Administrative Regions of Guyana. To-date the Commission has prepared two (2) Regional Land Use Plans: (i) Region 6 – East Berbice Regional Land Use Plan; and (ii) Region 9 – Rupununi Sub Region 1. Additionally, Corridor Land Use Plans for the Lethem – Linden and Linden to Soesdyke road corridors have been prepared.

4.1.5 Low Carbon Development Strategy

The Government of Guyana, in 2009, launched a Low Carbon Development Strategy (LCDS). The LCDS aims to transform Guyana’s current economy to that of a “low carbon economy” while addressing issues related to climate change through a compensatory scheme by marketing Guyana’s standing forest. The strategy is built on Guyana’s vision to encourage investments/economic development while protecting and maintaining its forest cover. The strategy has three pillars: (i) investment in low carbon economic infrastructure; (ii) investment and employment in low carbon economic sectors; and (ii) investment in communities and human capital. Forestry activities will be highly regulated to ensure compliance with national requirements.

4.1.6 The World Bank Safeguards Policies

Five World Bank safeguard policies were triggered by the project (i) Environmental Assessment (OP/BP 4.01), (ii) Natural Habitats (OP/BP 4.04), (iii) Physical Cultural Resources (OP/BP 4.11), Involuntary Resettlement (OP/BP 4.12), and Safety of Dams (OP/BP 4.37).

The Project is categorized as a category B investment under the World Bank Environmental Assessment Policy (OP/BP 4.01) and thus an environmental assessment was required during preparation of the project. According to the Policy, a Project is classified as Category B if:

“Its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A, EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation”

Natural Habitats (OP/BP 4.04):

This safeguard seeks to support the protection and rehabilitation of natural habitats associated with Bank-financed projects. The Natural Habitats Policy is triggered by any project (including any subproject under a sector investment or financial intermediary loan) with the potential to cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project). Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species. The Natural Habitats Policy distinguishes between critical and other natural habitats. Critical natural habitats are those natural habitats which are either (i) legally protected, (ii) officially proposed for protection, or (iii) unprotected but of known high conservation value (see OP 4.04, Annex A, Para. 1.(b) for official Bank definition). Bank-supported projects must avoid significant conversion or degradation of any critical natural habitats. The environmental assessment process (OP 4.01) should identify any critical natural habitats within a proposed project's area of influence. For other (non-critical) natural habitats, the Natural Habitats Policy requires avoiding or minimizing damage to natural habitats to the extent feasible (see OP 4.04, Para. 5). If significant conversion or degradation of a non-critical natural habitat is needed to achieve a project's key objectives, the project must include mitigation measures acceptable to the Bank.

A portion of the Project activities takes place within the EDWC. Although the EDWC dam is a man-made structure, it serves as a habitat to caiman, giant otters, and bats. Numerous species of birds nest in or migrate through the conservancy, including Muscovy Ducks, Blue-winged Teal, Pied-billed Grebes, Cormorants, Stripe-backed Bitterns, Egrets, Vultures, Snail Kites, and Great Kiskadees. Given the vast area of the uninhabited conservancy, the localized and short-term works proposed will not affect fauna and avi-fauna. All construction sites will be rehabilitated and re-vegetated with native shrubs and trees. The proposed Project will not result in significant degradation or conversion of natural habitats, given that

the works are limited to the upgrade and rehabilitation of existing structures. The Guyana Amazon Tropical Birds Society and the EPA confirmed that the conservancy dam has been sustainably managed. By improving the drainage capacity of the EDWC, the works aim to ensure that this natural habitat remains intact with operational changes considered insignificant in the context of the EDWC habitat. Rehabilitation works for the Cunha Canal will be confined entirely to lands already disturbed by human activity. The construction site is defined as an old field and is currently used as a disposal area for lumber operations waste (chips and wood debris). The local areas drained by the canal are water logged agricultural areas.

Physical Cultural Resources (OP/BP 4.11):

This policy is intended to avoid or mitigate adverse impacts on physical cultural resources from development projects financed by the World Bank. Physical cultural resources are defined (under this policy) as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. Their cultural interest may be at the local, provincial or national level, or within the international community. The assessment and mitigation is done through the Environmental Assessment Process. As no cultural property are at this stage anticipated to be affected by the works, the policy the project as a precautionary measure in case cultural resources are encountered as part of the environmental assessment process or during construction.

While activities to be carried out under the Project are not expected to impact any known cultural heritage sites, technical specifications for works will include "chance find procedures" to be followed in the event that culturally significant materials are discovered during the execution of civil works.

Involuntary Resettlement (OP/BP 4.10)

This policy is intended to avoid the long-term hardship, impoverishment, and environmental damage that may be caused by involuntary resettlement. The policy does this through: (a) avoiding involuntary resettlement where feasible, or minimized, exploring all viable alternative project designs; (b) where feasible conceiving and executing involuntary resettlement programs as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits and (c) assist displaced persons in their efforts to improve their livelihoods and standards of living or at least to restore them. The policy covers not only physical relocation, but any loss of land or other assets resulting in: (i) relocation or loss of shelter; (ii) loss of assets or access to assets; and (iii) loss of income sources or means of livelihood, whether or not the affected people must move to another location.

The policy also applies to the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

Given that the project requires relocation and compensation of Project Affected Persons, this policy is triggered and a Resettlement Policy Framework (RPF) was prepared as a separate document to guide the process of avoiding or compensating for the resettlement impacts identified.

As a result of the impacts on the BCL, the rehabilitation of the Cunha Canal under the proposed Project triggers the Involuntary Resettlement (OP/BP 4.12) policy. The works for the Canal have been assessed for involuntary resettlement impacts per OP 4.12, and it has been determined that the case of BCL is the only case of involuntary resettlement. Compensation will be provided from GRIF funds under Component 2 of the Project based on the Abbreviated Resettlement Plan.

Safety of Dams (OP/BP 4.37):

The EDWC is bordered by a 67 km long earthen dam constructed some 150 years ago. As defined under Bank policy, this is an existing small dam (under 15 meters height), however, as the EDWC has an extensive surface area; provides water and protects a significant population from flooding; is adjacent to natural habitats along the adjoining rivers; and there is a risk of significant adverse impacts due to potential failure of the dam on local communities and assets, the policy was triggered under the project. A detailed engineering assessment of the dam and its associated drainage structures has been completed under the CAP, covering the safety status, performance history and operation and maintenance procedures. Necessary remedial work and safety-related measures were identified in order to upgrade the safety status of the dam including immediate priority works on the northeast section of the dam, which will be carried out within the IDA Flood Risk Management Project and by the GoG. The results of the CAP have provided the engineering and safety guidance to the GoG for the design and development of dam strengthening programs.

4.2 Legislation

4.2.1 National Drainage and Irrigation Authority (NDIA) Act

The Drainage and Irrigation Act of 2004 provided for the establishment of NDIA. NDIA is the regulatory and co-ordinating agency responsible for the operation, maintenance, control and management of the drainage and irrigation and flood control system and works and harmonizing of activities to enhance agricultural production. The Act provides mechanisms for ensuring that existing drainage and irrigation system and flood control and any new expansion that are done, are operated and maintained in a sustainable manner. The Act also allows for public participation in the planning, management and

operation of drainage and irrigation facilities through Water Users' Associations and promotes and encourages the involvement of the private sector in the construction, management, operation and maintenance of drainage and irrigation and flood control systems. The NDIA Act also provides for cost recovery for the sustainable management of primary and secondary elements of drainage and irrigation systems and flood control. Generally, the Act provides for the development of an institutional structure in terms of water resources management strategy and water use planning for the primary purpose of locating, evaluating, conserving and distributing water resources of the country for agricultural purposes.

4.2.2 Environmental Protection Act (EP Act)

The Environmental Protection Act of 1996 is the first comprehensive environmental legislation in Guyana. The Act established the EPA. The goal of the Act is to *“provide for the management, conservation, protection and improvement of the environment, the prevention and/or control of pollution, the assessment of the impact of economic development on the environment, the sustainable use of natural resources and for matters incidental thereto connected therewith”*. The EP Act gives the EPA the mandate for the coordination of environmental management and outlines the legal process for undertaking sustainable and effective management of the natural environment.

The EPA administers the EIA process set out in Part IV of the Act. The Act requires that an EIA be conducted prior to authorization of any project, which may significantly affect the environment. The Act also requires measures to be implemented to prevent environmental pollution. Part V Section 19 (1) states that *“A person shall not (a) Undertake an activity that causes or is likely to cause pollution of the environment unless the person takes all reasonable and practicable measures to prevent or minimize any resulting adverse effect; (b) Discharge or cause or permit the entry into the environment of any contaminant in any amount, concentration or level in excess of that prescribed by the regulations or stipulated by an environmental authorization.”*

4.2.3 Environmental Protection Regulations

The Environmental Protection Regulations, made under the Environmental Protection Act, were gazetted in 2000. These regulations govern Water Quality, Noise, Air Quality and Hazardous Waste Management and are aimed at preventing pollution by regulating discharges and emissions. These pollution management regulations will regulate and control the activities of developmental projects such as forestry operations during construction and operation. Under the Noise Management Regulation, persons cannot carry out activities above the established noise limits without prior approval from The EPA. The Water Quality Regulation protects Guyana's water by controlling discharges of waste matter into any of the coastal and inland waters or land. The Hazardous Waste Management Regulation protects Guyana's

environment from hazardous waste generated including industrial waste, clinical wastes from hospitals, etc. The Air Quality Regulations requires emissions to be below a level so as to not affect the health of plants, animals and humans.

4.2.4 National Environmental Standards

The Environmental Protection Regulations requires the EPA to develop limits for various parameters. The EPA has so far, in collaboration with the Guyana National Bureau of Standards (GNBS), developed the following standards and which are applicable to this project and should be complied with:

1. Interim Guideline for Industrial Effluent Discharge into the Environment. (Water Quality Standard);
and
2. Interim Guideline for Noise Emission into the Environment. (Noise Standard).

4.2.5 Occupational Health and Safety Act

This Act deals with the regulation and registration of workplaces and the occupational health and safety of workers. It gives authorisation for occupational health and safety inspectors to enter and inspect workplaces. Under this Act the employer has a responsibility of ensuring workers health and safety is maintained. The Act requires the employer to display publicly an abstract of the Act, and other sections addressing various issues addressed in the Act. Construction workers are required to be trained and be equipped with the necessary personal protective equipment.

4.2.6 Labour Act

The Act specifies the conditions that an employer must observe in the contracting of employees. For example, Part V specifies that the entire wages of the employee must be paid as money and not otherwise. However, in occupations where it is customary to make partial payment of allowances in the form of food, toiletries, housing etc. these are acceptable and not considered illegal, if both the employer and employee have agreed to such terms. Wages should be payable either weekly, fortnightly or monthly, except otherwise agreed.

4.3 Institutional Framework

There are a number of Government Agencies and Institutions that have some oversight regarding the rehabilitation of the Cunha Canal. These agencies are highlighted below:

4.3.1 National Drainage and Irrigation Authority

The NDIA was established by the NDIA Act of 2004. The NDIA has a major role to play regarding the country's drainage, irrigation and flood control facilities and agricultural production. The NDIA is responsible for coordinating the operation and maintenance of drainage and irrigation activities including managing, operating and maintaining of drainage and irrigation systems and related access roads and facilities. The NDIA is also responsible for the development of programmes and plans to locate, evaluate, conserve and distribute water resources for agricultural development and for the efficient management, operation, evaluation and monitoring of drainage and irrigation systems. Importantly, the Authority is responsible for the development of procedures, norms, standards including irrigation and environmental as well as operation schedules for the efficient operation and maintenance of the drainage and irrigation systems.

4.3.2 Hydrometeorological Service (Hydromet)

The Hydrometeorological Service is a department under MoA. Its mission is to observe, archive and understand Guyana's weather and climate and provide meteorological, hydrological and oceanographic services in support of Guyana's national needs and international obligations.

4.3.3 Environmental Protection Agency

The EPA was established under the Environmental Protection Act of 1996. The Agency is governed by a Board of Directors, but falls under the direct supervision of the Office of the President. In Sec. 4 (1) (a), of the Act, the EPA is given the mandate to *"take such steps as are necessary for the effective management of the natural environment so as to ensure conservation, protection and sustainable use of its natural resources"*. In addition the Agency is given the overall responsibility to:

- Take necessary steps for effective management of the natural environment to ensure conservation, protection and sustainable use of its natural resources;
- Ensure that any developmental activity, which may cause an adverse effect on the natural environment, is assessed before such activity is commenced;
- Coordinate and maintain a programme for the conservation of biological diversity and its sustainable use; and
- Coordinate the establishment of national parks and protected areas system and a wildlife protection management programme.

4.3.4 Guyana Lands and Surveys Commission (GL&SC)

GLSC has the overall responsibility for land use planning and land administration. The Commission was established under the GLSC Act, Act No. 15 of 1999 in June 2001. The Commission envisions becoming a self-sustaining organization by 2010 with a mission “*to effectively and efficiently administer lands for the benefit of our clients and National Development¹”*.

The GL&SC has three main operational divisions: (i) Land Administration (ii) Land Information and Mapping (iii) Surveys. The General Administrative Divisions, which include support and control, are administered by (i) Office of the Commissioner (ii) Corporate Affairs. The functions of the Commission, as stipulated by the Guyana Lands and Surveys Commission Act, 1999, include the following:

- To have charge of and act as guardian over all public lands, rivers and creeks of Guyana.
- To receive and evaluate offers to purchase or let public lands and to issue, for and on behalf of the President, grants, leases and permits to occupy such lands, in accordance with any law regulating the administration and disposition of public lands.
- To establish and maintain liaison between all the agencies involved in the registration and storage of records relating to public land in any tenure, including the registration of deeds and title to land.
- To formulate policy on geographic and land information, and set standards in relation to digital data, establish the framework for a national network of geographic information systems, and develop and maintain a parcel-based land information system.
- To initiate studies into and formulate policy on the development of public lands, including the feasibility of specific land development projects.
- To establish and maintain liaison with the responsible agencies to promote and monitor, in relation to public lands, the provision and maintenance of drainage and irrigation systems, access roads and other infrastructure, through such measures as may be appropriate.
- To compile and maintain an inventory of all the land resources of Guyana, their quality degree, pattern of utilization and related matters.
- To prepare land use plans for Guyana or any part of Guyana, except any municipality which is subject to a planning scheme (or interim development control pending the preparation of a planning scheme) under the Town and Country Planning Act.
- To advise Government on policy relating to public lands, land surveys and any other matters related to the functions of the Commission.

¹ GL&SC. (2004). Guyana Lands & Surveys Commission Strategic Plan

5.0 Impact Assessment

5.1 Introduction

This section of the report identifies the potential environmental and social impacts associated with the rehabilitation of the Cunha Canal and the feasible mitigation measures and/or preventative actions that can be implemented to address the identified issues.

The potential impacts are described in Table 8 based on the bio-physical and socio-economic effects during the construction and operational phases of the project. The significance of the impact is based on the degree and duration, high probability of occurrence and its effect on sensitive receptors. Significance is determined by:

- Magnitude and extent
- Reversibility
- Longevity
- Probability of occurrence

The impacts identified in this section are based, mainly, on those that arise during the construction phase of the project. Sections 6 & 7 take into account response measures that must be in place to address the impacts arising from accidents and during potential emergencies.

Table 8: Potential Environmental and Social Impacts

Conditions	Environmental Impact	Significance
Construction Phase		
Physical Environment		
Environmental Aspect: Land/Soil		
Realignment and widening of the Canal	Loss of land through direct land take.	Lo, Irr, LT, UM, Un, Sig.
Land clearing	Removal of vegetation, where necessary, to facilitate canal widening, re-routing and de-siltation may contribute to erosion.	Lo, Irr, LT, UM, Un, Insig.
Operation of machines	Compaction of soil from operation of heavy-duty machines to facilitate widening and de-silting of the canal.	Lo, Rev, LT, Un, UM, Insig
Disposal of materials (sediments and vegetation)	Improper disposal of silt and vegetation from the canal. Improper disposal of vegetation from the embankment as a result of widening the canal.	Lo, Irr, LT, UM, Un, Insig.

Conditions	Environmental Impact	Significance
Construction Phase		
Storage of fuel and re-fuelling of equipment.	Fuel and/or oil spill from the operation of heavy-duty machines can cause soil contamination.	Lo, ST, Irr, Av, M, Sig
Environmental Aspect: Emissions to Water		
Fuel spills	Water contamination from fuel/oil spills.	Ex, Irr, LT, Av, M, Sig
Erosion and Sedimentation	From material stockpiles and excavated materials resulting in discoloration and blockage of the drainage system	Ex, Rev, ST, Av, M, Sig
Waste disposal	Improper solid waste disposal by workers such as food wrappers, boxes etc.	Ex, Rev, LT, Av, M, Sig
Environmental Aspect: Emissions to Air		
Operation of heavy-duty machines and equipment	Noise from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge.	Lo, Rev, ST, Av, M, Insig
Operation of heavy duty machines and equipment	Fumes from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge.	Lo, Rev, ST, Av, M, Insig
Operation of machines, storage of materials and construction activities	Dust from construction activities, material and waste stockpiles and movement of heavy duty equipment can affect workers and nearby residents.	Lo, Rev, ST, Av, M, Sig
Biological Environment		
Flora	Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.	Lo, Irr, LT, Un, UM, Insig
Fauna	Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities.	Lo, Irr, LT, Un, UM, Insig
Socio-economic Environment		
Environmental Aspect: Risks in the Working Environment		
Employees' safety can be compromised during the operation of machines.	Employees at risk from accidents and excessive noise from the operation of heavy-duty machines during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge.	Lo, ST, A, Irr, M, Insig
Road Safety	Traffic congestion and accidents on the EBD Public Road as a result of bridge construction and storage of construction materials.	Lo, Un, ST, Sig, UM, Irr
Relocation/Displacement	Rerouting of canal through BCL property resulting in loss of land and relocation of some aspect of the operation.	Lo, Un, ST, Sig, UM, Irr

Conditions	Environmental Impact	Significance
Construction Phase		
Employment	Overall short-term increase in employment.	Ex, Rev, ST, Av, M, Sig (Positive)
Operational Phase: Maintenance Activities		
Periodic de-silting of the canal to remove sediments and weeds.	Risks of accidents to workers and exposure to excessive noise from the operation of heavy-duty machines.	Lo, ST, A, Irr, M, Insig
	Fuel spills from the operation of machines may contaminate water and soil.	Ex, Irr, LT, Av, M, Sig
Vegetative removal to maintain embankments.	Continuous habitat disturbance.	Lo, Irr, LT, Un, UM, Insig
Flooding	Breaches along the embankment	Lo, M, ST, Sig, UM, Rev

Impact Significance Parameters

Lo – Localised	Ex – Extensive	Rev – Reversible	Irr. Irreversible
ST – Short Term	LT – Long Term	Av. – Avoidable	Un - avoidable
Sig. – Significant	Insig. – Insignificant	M. – Mitigable	UM – Unmitigable

5.2 Potential Impacts during the Construction Phase

The main activities associated with the project during the construction phase are outlined in Section 2.4.1. Execution of these activities will have the potential to directly or indirectly affect the environment. The impact prediction matrix as detailed in Table 8 highlights the potential/predicted impacts, their associated magnitude, importance and timeframe during the construction phase of the project and this section of the report discusses these impacts in greater detail.

Rehabilitation works for the Cunha Canal will occur along a total length of 2.8km and include (i) de-silting and widening of the current drainage channel, (ii) Rerouting the canal to its original alignment in the vicinity of BCL Operation, (iii) rehabilitation of the old sluice, and, (iv) construction of a bridge across the EBD Public Road

5.2.1 Impacts on the Physical Environment

5.2.1.1 Land/Soil

Potential Impact

Removal of vegetation and land disturbance associated with the aforementioned activities will occur along the canal. The possible impacts that may arise from such activities are:

- Loss of land due to direct land take;
- Removal of vegetation and soil disturbance to facilitate the widening of the canal, re-routing to its original alignment and de-siltation may contribute to some level of erosion;
- Compaction of soil from the operation of heavy-duty machines to facilitate widening, re-routing and desilting of the canal;
- Fuel and/or oil spill from the operation of heavy-duty machines can cause soil contamination;
- Improper disposal of silt and vegetation from the canal; and
- Improper disposal of vegetation from the embankment as a result of widening the canal.

Analysis

Land taken up by the project will be lost to other uses. A portion of land on both sides of the canal between the EDWC and the Public Road will be taken up. However, the amount of land is expected to be minimal. A portion of land with BCL operation will also be lost to the project. This area, which falls within the BCL Compound, was the previous alignment of the Canal and will be rehabilitated. As such, the land available to be utilized by the Company will be reduced. This impact is, however, unavoidable and necessary to facilitate the project.

Removing the vegetative cover exposes the soil to the elements and thus, the potential of the soil to easily lose moisture, becoming dry, and increases its susceptibility to erosion. Soil disturbance can also contribute to erosion. To minimize this effect, and avoid extensive surface run-off, activities should be concentrated to the dry periods. Slopes on the embankments should be constructed to the appropriate degree to allow for adequate runoff and prevention of erosion. An area prone to this effect is the area with the current BCL Compound since the soil consists of compacted saw dust and wood waste and will become loose easily.

The use of heavy duty machines and equipment and their constant movement over the exposed soil can result in soil compaction beyond permeability which can lead to ponding after periods of heavy rainfall. Compaction also makes regeneration of vegetation difficult. To avoid or minimize this effect, most of the construction activities should be concentrated to the dry season/period. Additionally, soil compaction may be considered as an indirect positive effect since it aids the strengthening of the embankment.

Storage of fuel, leakage from equipment, refueling and servicing of machines in the field can result in fuel/oil spills. Workers negligence and inadequate storage facilities can contribute to these spills which can contaminate the soil. Care should be taken when handling fuel and oil in keeping with procedures outlined in Sections 6 & 7.

The project will generate large volumes of sediment due to the extent of earthworks. The material is mostly fine-grained silts and clays given the particular soil type, refer to Section 3.2.1. Therefore, this material can be easily disposed along the discharge channel banks and adjacent areas, thus, acting as a soil modification. However, care should be taken, if materials are disposed in adjacent areas, to avoid stockpiling or creating spoil piles. Field-applied materials should be leveled to avoid impacts on the drainage of the area.

5.2.1.2 Water

Potential Impact

The surface water quality can become contaminated or affected from potential threats as those listed below due to construction activities.

- Water contamination from fuel/oil spills;
- Water contamination from sedimentation;
- Blockage of existing drainage system from erosion and sedimentation; and
- Improper solid waste disposal by workers such as food wrappers, boxes etc.

Analysis

During the construction phase, adequate measures for storage of fuel and waste oil would be limited since it would be temporary. Spills and accidents can occur from improper storage and handling and can result in water contamination. The spilled material can flow or transported along with runoff into the canal. These materials can also leach into ground water resulting in contamination. However, during construction activities, it is not expected that significant quantities of fuel will be stored onsite, if at all. However, care must be taken during the re-fueling process and when transporting fuel from the storage tanks/trucks to the machines to avoid unnecessary spills and reduce the risk associated with contamination. Regular maintenance of machines and equipment must be carried out frequently to ensure proper functioning as this reduces the potential for oil leaks

Materials eroded from the embankment and construction materials and waste debris stockpiles can end up in existing waterways resulting in sedimentation. These sediments can end up in the small drains within the area. These materials can also result in blockage, especially in roadside drains in the vicinity of the bridge construction on the EBD Public Road. Materials stockpiles will have to be located away from water bodies and drains. There is sufficient space in the area where the bridge will be constructed and the sluice to allow for this. Waste debris, especially construction waste, will have to be removed from the

site in a timely manner. The materials can be utilized by the NDC to fix existing streets within the area. It is recommended the NDC be approached in this regard. Any blockage of waterways as a result of sedimentation should be removed immediately. Disrupted materials within the BCL Compound which consist of saw dust and other wood waste can be easily eroded and end up in water bodies including the Demerara River.

The improper management of solid waste can affect water quality. Solid waste can often end up in water bodies as a result of direct dumping which can lead to contamination and blockage. During the construction phase, care must be taken by all workers to dispose of any solid waste material generated in keeping with the procedures outlined in Sections 6 & 7.

5.2.1.3 Air

Potential Impact

During the construction phase there are several activities which can affect the air quality in the project area. However, the level of impact will be localized, short-term and insignificant. In addition, these impacts, especially to workers, can be mitigated. The following potential impacts may arise as a result of construction activities:

- Noise from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge;
- Fumes from the operation of machinery used during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge; and
- Dust from moving of equipment and stockpiles.

Analysis

Construction activities generally results in the generation of significant levels of noise. The operation of heavy duty machines and equipment used for de-silting and widening the canal, rehabilitation of the sluice and construction of the bridge will generate noise levels above the alert threshold of 86 decibels and hazard threshold of 95 decibels. Continuous exposure to noise levels above the internationally accepted level of 90 decibels can cause noise induced hearing loss for workers. Noise levels above the tolerable threshold of 72 decibels can result in workers' fatigue, tiredness, low morale and decreased productivity. It is expected that the construction activities will generate significant amount of noise. However, there are no immediate communities in close proximity to the canal that will be affected by the increased noise level. Nevertheless, measures must be in place, as recommended by the EPA, to reduce

the noise level from construction activities for workers and other persons on-site and are detailed in Section 6 of this report.

The main area of influence, that is the area of the bridge construction and sluice rehabilitation and realignment of the Canal, will be the main area to be affected by noise. In addition to the noisy equipment, construction activities such as dismantling of the existing roadway and pile driving can also generate significant levels of noise. Given that residences are not located in close proximity to this area noise nuisance is not expected to be a significant problem. In addition, the BCL operation nearby generates a fair amount on noise. However, measures must be implemented to reduce this impact. Construction equipment should be fitted with mufflers to reduce the noise emanating. Construction activities should also be restricted to working hours (08:00 hrs to 17:00 hrs). No construction activity should take place at nights or on Sundays.

The operation of the machines and equipment will also generate fumes which may have some effect on the air quality in the surrounding area. However, the level of impact will be localized, short-term and insignificant, to the point of negligible.

Dust will be generated from the movement of equipment over dry areas. Construction material stockpiles such as sand can become airborne and contribute to a dust nuisance. Construction activities such as removal of existing structures and utilizing of cement can also generate dust. Disruption of the area consisting of saw dust within BCL Compound can also generate some amount of dust. Most of these impacts may occur in the vicinity of the bridge and the sluice, In this regard, since these areas are not in close proximity to human dwellings, the potential for dust nuisance is not great. However, measures should be implemented to reduce this impact. These should include soaking of dry surface to be traverse by equipment, covering or soaking stockpiles, and transporting materials to the site as need thus maintaining a small stockpile.

5.2.2 Impacts to the Biological Environment

5.2.2.1 Flora

Potential Impact

The potential impact on the flora in the project is:

- Direct loss due to removal to facilitate construction.

Analysis

The Canal area from the EDWC to the Demerara River is covered by secondary vegetation and indicates a highly human disturbed area. No rare, threaten or endangered species were found within the extent of the Canal area. Vegetation removal is essential to various aspects of project and, therefore, unavoidable. Earthworks such as widening, de-silting and re-routing the canal to its original alignment will remove or impact the secondary vegetation found along this drainage system, mostly common weeds (refer to Section 3.3.1). The area of immediate influence consists of shrub-like vegetation, mainly of common weeds. Tree type vegetation, indicting swampy conditions, can be found towards the EDWC. Although some amount of vegetation will be lost type is vegetation is common in the project area and can also be found throughout the coastal area of Guyana. As such this impact is deemed insignificant.

5.2.2.2 Fauna

Potential Impact

The potential impact on the fauna in the project environment is:

- Habitat loss, destruction, fragmentation due to land clearing as a result of construction activities;

Analysis

The faunal diversity in the area is sparse and most species observed during the field exercise were domestic animals. Although a small portion of land area will be taken up by the project and some vegetation will be removed, there is available within the project environment enough land to support these animals. Therefore, the impact of habitat disruption on the biological environment will be localized and insignificant especially given that this area has been highly disturbed.

As part of NDIA annual maintenance programme dredging of the Cunha channel is carried out. This activity is periodic since the channel is existing and currently in use but operates at a reduced efficiency due to the diversion in the 1990's. As such there will be no effect on marine biodiversity as a result of project activities entailing dredging since the marine biodiversity in the canal is very limited.

5.2.3 Impacts to the Socio-Economic Environment

5.2.3.1 Health and Safety

Potential Impact

Construction activities will have an impact on the health and safety of workers and the general public. The major impacts include:

- Risk of accidents from the operation of heavy-duty machines during the de-silting process, re-routing of the canal, rehabilitation of the sluice and construction of the bridge; and
- Exposure to excessive noise

Analysis

Health and safety is always a key concern at any construction site. Workers are usually exposed to situations which can result in serious accidents, some of which can be fatal. Risks can involve the accident from the use of heavy duty machines and equipment, continuous exposure to noisy machines/equipment, improper use of equipment, etc. BCL workers will be exposed to risks from the activities within their Compound and efforts should be made to prevent any incident from occurring. Efforts should be made also to secure the construction zones from the general public and erect the necessary warning signs. These risks are localized, short-term and can be mitigated and will be significantly minimized through the use of personal protective equipment (PPE) and following of strict and established procedures and guidelines.

5.2.3.2 Displacement and Relocation

Potential Impact

The Project will result in some level of relocation and displacement which are outlined below:

- Permanent relocation of some aspect of BCL operation; and
- Temporary relocation of utilities.

Analysis

When the Canal was diverted to the current channel, BCL utilised the area along the old alignment between the sluice and the Demerara River for its operations. Some aspects of the operations are

currently located in close proximity to this alignment. These include a log pond, a secondary processing operation and a dust containment bin. The realignment of the canal to its original alignment will require some changes to the BCL operations. A survey was done to determine the buildings and other structures that would be affected. The result of this survey is outlined in Appendix F. The main building to be affected would be the Secondary Processing Shed. This is a large shed that house several pieces of equipment. Other areas to be affected include a fence on the southern boundary of the compound, a guard hut and a generator shed. Two (2) bridges that link the Company's log pond with the rest of the operation will also be affected.



Figure 7: Secondary processing shed and the fence that would have to be relocated.

To ensure the magnitude of the impacts of the project on the Company is minimised, the Company has been informed of the Project and the necessary changes that will take place. The Company has also indicated via letter that it has no objection to the Project. This letter is attached as Appendix G.

There were several meetings between the Company and personnel from MoA to discuss the Project and its possible effects on the Company. Details of these meetings are attached as Appendix B. Initially, the BCL requested that the Canal be diverted away from the main processing area. However, it was indicated that this was not possible since:

- The diversion would result in a loss of energy since the water would have to flow through a sluice then a turn.
- Since there will be a heavy flow of water during the rainy season there is the possibility of erosion at the turn, especially since the material in that area is loose, consisting mainly of wood waste.
- A diversion will still pass through the Company's log pond, thus disrupting operations.

If the Canal is to be realigned as proposed BCL has the following concerns:

- The Secondary Processing Shed is an integral part of the Company's operation, housing several pieces of equipment. Relocation of this shed would be costly, since a new shed will have to be constructed and all the equipment relocated.
- The Company supplies external markets with products from this operation. The relocation activities will disrupt this operation, resulting in downtime and affecting the Company's ability to fulfill its market. The disruption will also result in a loss of revenue to the Company during the relocation period.
- A number of employees will be affected by this disruption. The Company indicated that it will have to continue paying a salary to these workers during the period of disruption.
- The metal and concrete bridge over the existing Canal should be maintained since it is in good condition, and also, the removal of both bridges will severely affect the Company's operation. If this bridge is to be removed, then BCL will have to construct a new bridge over the Canal to link the log pond to the other aspects of the operation.

The Company has indicated that it can handle the other areas to be affected and the relocation activities. BCL had indicated that it would be seeking some form of compensations/assistance from the Government to assist with the relocation and disruption. An official correspondence was submitted by the Company to MoA in February 2010. This response should outline the estimated cost for relocation and disruption of activities.

Upon receipt of the request, the Government, through MoA, and BCL had further engagements and arrived at an agreement regarding the compensation. As such the agreed compensation will be provided from GRIF funds under Component 2 of the Project based on the Abbreviated Resettlement Plan.

To facilitate the bridge construction along the EBD Public Road public utilities located along the roadside may have to be temporarily be relocated. This includes Guyana Power and Light Company (GPL) power lines, Guyana Telephone and Telegraph Company (GTT) cable and Guyana Water Inc. (GWI) water mains. It is recommended that these companies be contacted prior to construction and a visit be made to determine the presence of these service lines and the need for relocation. Relocation may be necessary so as to not disrupt any of the services. Any relocation would be temporary and for the duration of the construction activities. Allowances will be made for these activities in the contract document for the construction of the public road bridge.

5.2.3.3 Traffic Congestion and Accidents

Potential Impact

Construction of the bridge will affect the traffic situation on the East Bank Public Road in the following ways:

- Risk of vehicular accidents;
- Traffic congestion; and
- Encumbrances from storage of construction materials.

Analysis

The East Bank Roadway facilitates a high volume of traffic. Traffic passing through this area includes vehicles traversing to and from the CBJ International Airport, sand trucks, and vehicles traversing to the town of Linden and interior locations. The construction of the bridge on the public road will disrupt the traffic flow. This can lead to severe traffic congestion, especially during peak hours.

Since several activities will be undertaken at the site at any one time and heavy duty equipment will be operating in close proximity to the public road, there is the potential for accidents to occur involving road users. Accidents can occur between road users or between road users and construction equipment/workers. Traffic congestion can also contribute to accidents.

Stockpiles of construction materials and waste piles can serve as encumbrances and affect the flow of traffic as well as pedestrian. These stockpiles should be located away from the main activity area.

The MoPWC is responsible for managing the East Bank Public Road. The Ministry has been engaged in the Project and has offered its no objection to the construction of the bridge. A copy of this letter is attached as Appendix H. MoA and the MoPWC has also signed a Memoranda of Understanding (MoU) regarding the construction and operations of the bridge. The bridge will be construction based on the specifications of MoPWC and would be handed to that Ministry upon completion of construction.

A traffic management strategy should be developed to manage the flow of traffic during construction activities. The bridge should be constructed in phases to allow traffic flow on one lane. The existing road shoulder is sufficient to allow a bypass. This area can be graded and prepared to increase the lane width. The entire work zone for the bridge should be cordoned off. Advance warning signs should be placed approximately 50 m before approaching site. Additional signs should be placed at intervals. Cones should be placed to demarcate construction and lane closure zone. Flagmen with stop and go signs should be

placed on either side of approach to guide oncoming traffic. The site should be lighted at night to prevent accidents. Lights should also be used to demarcate the construction zone. It is recommended that no construction activity be done at nights. In addition, to reduce the time period for which traffic would be disrupted, it is recommended that precast materials be used. All activities in the vicinity of the public road should be done in accordance with the guidelines of the MoPWC.

5.2.3.4 Employment

Potential Impact

Construction activities will have a positive impact on employment within the wider area.

Analysis

Construction will be done utilizing contractors for different aspect of the project. Construction activities will require the employment of skilled and unskilled labour. This provides an opportunity for local individuals to be employed and thus results in an increase income for those persons.

5.3 Potential Impacts during the Operational Phase

5.3.1 Maintenance Activities

Potential Impact

The key activities during this phase are those associated with continuous maintenance of the proposed channel and its related structures. These include the periodic de-silting of the canal to remove sediments and weeds and vegetative removal to maintain embankments. The potential impacts associated with these activities are:

- Risks of accidents to workers and exposure to excessive noise from the operation of heavy-duty machines;
- Fuel spills from the operation of machines may contaminate water and soil; and
- Continuous habitat disturbance.

Analysis

Maintenance of the Cunha Canal drainage system will entail activities designed to keep the channel clear and the structures in good working conditions. These include manual and mechanical vegetation management and removal, mechanical desilting of channels and especially outfalls, greasing of pulleys,

winches and cables for the sluice, and normal preventive maintenance. Although these activities have low environmental impacts, they have the potential for localised negative impacts if good practices are not followed, in particular proper disposal of used oils, careful re-fuelling practices, as well as, health and safety issues such as risks of accidents to works and exposure to excessive noise from the operation of machinery and equipment. Impacts to the surrounding biological environment are also localised and insignificant given that the area is under direct human influence.

5.3.2 Flooding

Potential Impact

Flow of water through the proposed Cunha Canal can result in breaches of the embankment resulting in flooding.

Analysis

The Cunha Canal will discharge a significant volume of water from the Conservancy to the Demerara River. During the raining season, when discharge is expected to be at the maximum, the water level in the canal would be high. This level of water can exert pressure on both embankments along the canal which can result in breaches. This can cause flooding to nearby areas, including farmlands and residences. In order to prevent this occurrence, the embankments on both sides are designed to withstand the pressure of the water. Maintenance activities will also be conducted as necessary. Maintenance would include:

- Routine inspection to dams and structures
- Routine cleaning of channels
- Routine cleaning of embankments
- Raising low spots on the embankments
- Maintenance of structures
- Repairs to slips

A freeboard will be maintained to prevent overtopping. The embankments will also be monitored frequently to ensure its stability. In addition, the inlet and outlet structures will be used to control the amount of water flowing through the channel at any given time. In this regard, the likelihood of this occurrence is minimal. However, in the event that there is a breach resulting in flooding, emergency response measures are outlined in Section 7.2.

6.0 Environmental Management Plan

6.1 Introduction

The EMP for the rehabilitation of the Cunha Canal identifies activities to be undertaken in an effort to mitigate the principal adverse effects of the project. The Plan describes the way in which the main environmental impacts of the project can be managed, and prescribes appropriate mitigation measures to be adopted during the rehabilitation and construction activities as well as the operational life of the project. These impacts were identified and discussed in section 5 and their significance has been taken as a function of the following criteria:

- Magnitude and extent.
- Reversibility.
- Longevity.
- Probability of occurrence.

The objectives of the EMP are to:

- Set out measures and strategies to address the environmental issues related to the rehabilitation and construction as well as operational activities of the project.
- Formulate a monitoring plan to ensure that the activities are executed in accordance with these environmental requirements and to establish the impacts of the project with a view to implementing any necessary further action to minimize negative impacts.

This EMP will consist of the following:

- Mitigation Plan
- Monitoring Plan
- Emergency Response Plan

Since both the rehabilitation and construction activities will be undertaken simultaneously the mitigation measures for potential impacts are discussed together.

6.2 Responsibility

The NDIA will be responsible for the implementation of the Project. However, it is envisaged that the project will be executed by two (2) contractors; one being responsible for the rehabilitation of the Canal

and Sluice and the other for the construction of the bridge. Since NDIA will be implementing the project, the Authority will have the responsibility of ensuring the EMP and other environmental requirements are implemented. The environmental requirements should be communicated to the contractors who will have to implement on the ground. NDIA will have to ensure these requirements are implemented by monitoring of the activities.

6.3 Impact Mitigation

Mitigation measures were identified to prevent, minimize and manage the adverse environmental impacts discussed in section 5. These measures outlined below.

6.3.1 Erosion, Sedimentation and Compaction

The following measures should be implemented to reduce the impact of erosion and sedimentation activities:

- Minimize removal of vegetation to areas where it is absolutely necessary.
- Encourage re-vegetation in areas where possible to prevent soil exposure.
- Monitor areas of exposed soil during periods of heavy rainfall.
- Slopes should be constructed at the recommended angle to prevent collapse.
- Use appropriate machines for all earth works.
- Designate routes for heavy duty equipment to prevent compaction of soil.
- If ponding is observed due to compaction, it may be necessary to scarify the topsoil.
- Consider the weather pattern before initiating major earthworks. Earthworks should be avoided during periods of heavy rainfall.
- Materials stockpiles and waste debris should be located away from the drainage system.
- Stockpiles should be kept to a minimum.
- Stockpiles may require berming to collect sediments from runoff during periods of heavy rainfall.
- Construction waste materials should be removed from site as soon as possible.
- The area around the inlet and outlet of the culvert under the bridge will have to be stabilized as soon as possible to minimize erosion around the culvert.

6.3.2 Noise

As identified in the impact section, noise will be a significant environmental impact that requires mitigation. The EPA, in collaboration with GNBS, has developed Guidelines for Noise Emission into the Environment. The Standard specifies noise limits for construction activities both for daytime and during the night. The daytime limit (06:00hr – 18:00hr) is 86 dB while the limit in the night is 75dB. Given the

proximity of residents to the activities locations noise is not anticipated to be a significant problem. However, to comply with the National Standard and reduce this impact the following are measures should be implemented:

- Restrict construction activities to during the day. Noisy activities should not occur during the night or on Sundays and Holidays.
- Provide hearing protection to workers exposed to high noise levels such as those involved in demolition.
- Provide earplugs for employees who operate heavy duty machines.
- Employees working in high noise levels areas should be mandated to wear earmuffs or earplugs as required.
- Ensure that machinery and equipment are working efficiently and have installed the required muffler devices.

6.3.3 Dust

Dust, though localized, is a potential impact that would require some level of mitigation as outlined in Section 5. The following measures should be implemented to reduce the impact of dust on the environment:

- Personnel working in dusty environments should be required to use respirators.
- During dry periods it may be necessary to soak routes traversed by vehicles and equipment.
- Materials should be transported to site as needed thus resulting in small stockpiles.
- If necessary, the stockpile would also be soaked with water periodically
- The burning of construction waste and cleared vegetation should be prohibited to avoid smoke nuisance.

6.3.4 Fuel, Lubricants and Chemicals

Fuel and lubricants are classified as hazardous materials and require special consideration in terms of transportation, storage and handling. The following measures should be implemented to ensure the risks of contamination of soil or water from spillages are minimized:

- Since the construction activities would be temporary, it would not be feasible to construct proper facility for fuel storage. As such, it is recommended that fuel be transported to the site as needed or in small quantities.

- Fuel which will require storage should be sited a safe distance from waterways, site offices and work areas.
- Care should be taken to prevent spillage and leakage of fuel during off loading and refueling. When refueling is completed, all nozzles, hoses and other materials should be stored in a proper manner to avoid spills.
- Drip pans can be placed under the fuel/vehicle coupling when vehicle tanks are being filled. This should prevent the possible contamination from leakage of fuel.
- Regular maintenance of machinery should be done to avoid leakages.
- Spill kits should be made available in the event of spillages.
- Workers, mechanics and other staff should be trained on the proper use of these kits.
- Adequate signage should be installed in fuel storage areas such as No Smoking and Flammable Materials.
- Fuel storage tanks/containers should be monitored for leaks.
- Fire containment measures such as extinguishers or sand buckets should be place in fuel storage/re-fuelling areas.
- The on-site fuelling area should be deemed a 'no smoking' zone and all staff required to turn off cell phones when in that general vicinity.

6.3.5 Waste Management

Several types of waste can be generated from the various activities that would require different methods of disposal. Table 9 outlines the various types of waste that will be generated and their recommended disposal method.

Table 9: Types of waste and recommended disposal methods

Waste Category	Waste Type	Disposal Method
Solid Waste	Construction Waste	Construction waste will include materials removed from the road to facilitate the bridge construction. These materials can be given to the NDC to be used for fixing of streets and land-filling. All other construction was including wood, empty sacks, etc, should be removed from site. It is recommended that wood waste be re-used for other activities.
	Domestic Waste	The waste stream would include waste such as empty plastic bottles, styrofoam boxes, paper and cardboard. A collection bin should be provided on site to be utilized by workers. This bin should be emptied as necessary. Waste should be disposed of at a designated facility.
Liquid Waste	Sewage	It is expected that toilet facilities be provided for workers. Portable sanitary units are recommended. These units should be emptied as necessary by companies that provides that service to minimize leaks/spillages. However, if Pit Latrines will be utilized, these should be constructed in accordance to the Public Health Ordinance of 1953.
Hazardous Waste	Waste Oil	Waste oil from the servicing of equipment and machinery should be collected and removed from site.
	Used Batteries	Used batteries should be recycled. Currently, persons are buying these used batteries to be shipped overseas for recycling. Some distributors of batteries are also in the business of recollecting the batteries after use for recycling.
	Oily Rags/Filters	These materials can be burned since the quantity should be quite small and disposal options limited. It should be noted though that a Hazardous Waste Cell would be constructed within the new Sanitary Landfill currently being constructed at Haag Bosch on the East Bank Demerara. When this facility is up and running it is expected that all hazardous materials that require disposal should be taken to the landfill.

6.3.6 Aesthetic

Construction sites are sometimes unsightly and can affect the aesthetics of the area. The following measures should be implemented to reduce this impact:

- Stockpile construction materials in an orderly manner.
- Solid waste should not be disposed of in an open manner. Waste should be disposed of as outlined in the Table above.

- Waste should be removed from site in a timely manner.

6.3.7 Health and Safety

Occupational Health and Safety is a significant issue at construction facilities and require several measures to be implemented to ensure the activities are safe to both the workers and the general public.

The following measures should be considered:

- Designate a person on staff with responsibilities for Occupational Health and Safety.
- Develop and implement Safety Rules for the operation which all employees should comply with and can include the following:
 - Appropriate safety equipment and protective clothing should be provided for certain categories of workers as recommended by the Health and Safety Committee or Management.
 - Employees are required to wear safety equipment and protective clothing provided by the Contractor in designated areas as and when directed by Management.
 - Employees not wearing prescribed safety clothing and associated equipment in an area where the use of such in mandatory will be required to leave such designated area and will be subject to disciplinary action.
 - Employees will be expected to take due care of items of safety equipment and protective clothing issued to them.
 - Employees who abuse safety equipment and protective clothing or fail to comply with instructions or requirements to wear such in designated areas shall be subject to disciplinary action.
 - Machines are to be operated:
 - By competent and authorized personnel.
 - Only when safety gears are in position.
 - In a manner that does not endanger other employees, the general public or property.
 - When the work area is clear and safe.
 - Operators are required to wear seat belts in the correct manner when operating machinery fitted with seat belts
 - Operators of heavy duty machinery must be licensed in accordance with the Laws of Guyana.
 - Passengers are not permitted on mobile equipment unless they are being trained to operate the machine or are required to ride on it as an unavoidable part of their duties provided it is safe to do so.

- Smoking should absolutely not be permitted anywhere in or near fuel area

- The Contractors would have the responsibility for the health and safety and well being of all workers and in ensuring that responsibility the Contractors should:
 - Provide first aid kits at the site office.
 - Provide adequate masks, face shield, gloves, fire proof garments, welding shields and goggles as protective measures as is considered necessary.
 - Employees required to work in the rain will be provided with wet weather gear.
 - Overalls and safety helmets shall be provided to employees as is considered necessary.

- In addition to the above undertakings the Contractors should also:
 - Ensure that workers are properly oriented to safety and health practices.
 - Abide by the guidelines set out in the Occupational Health and Safety Act.
 - Ensure workers wear the necessary protective gear at all times.
 - Ensure there are trained personnel in First Aid.
 - Liaise with health facilities in case of emergencies.
 - Provide potable water for employees.
 - Ensure garbage and sewage collection and disposal.

- A system should be implemented to detect hazards that may arise. Both the Contractors and the workers have responsibility in this area.
 - The employer should:
 - Inspect all machines and equipment for the existence of potential hazards and ensure that they are in working order.
 - Inform the worker of any hazards present.
 - Instruct the employee in the correct safe work procedure to prevent any injuries and ensure that those instructions are followed.
 - Provide the necessary safety protective gear when required.

 - The employee on the other hand has the obligation to:
 - Cease work once a hazard is perceived.
 - Report the hazards to the supervisor who will in company with the safety representative inspect the condition or circumstance and determine its validity.

- Obey the instruction to perform alternative work or cease work completely as directed by the supervisor.
 - Return to the workstation or proceed once the hazard has been adequately dealt with or eliminated.
- Adequate and appropriate PPE should be used. Table 10 outlines the potential hazards and the appropriate equipment that can be used.
- Efforts should be implemented to prevent the risk of accidents to members of the public and other road users. In this regard the following should be implemented:
- Work with the police to ensure proper traffic control.
 - Place appropriate cautionary signs at in the vicinity of work areas as necessary.
 - Cordon off areas of major activities.

Table 10: Hazards and the suggested Personal Protective Equipment (PPE)

Objective	Workplace Hazard	Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and over head power cords.	Plastic Helmets with top and side impact protection.
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals.
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists,

Objective	Workplace Hazard	Suggested PPE
		vapors and gases). Single or multi-gas personal monitors, if available.
	Oxygen deficiency	Portable or supplied air (fixed lines). On-site rescue equipment.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Insulating clothing, body suits, aprons etc. of appropriate materials.

Source: *The World Bank Environmental, Health and Safety (EHS) Guidelines*

6.3.8 Traffic Congestion

The construction of the bridge will severely affect the flow of traffic on the EBD roadway as outlined in Section 5. However, the following measures should be implemented to reduce this impact and prevent the occurrence of accidents:

- Make suitable provision, including the use of a bypass to accommodate all vehicular and pedestrian traffic safely and with a minimum of inconvenience through or around the work area. It is recommended that enough space be maintained to accommodate a single heavy vehicle in one direction and car traffic in one directions traveling at a speed of 10 km/h. There is room for grading, shaping and placement of material on the road shoulder and to construct a temporary carriageway to accommodate traffic.
- Culvert should be constructed in phases to allow for the free flow of traffic.
- Precast materials should be used to reduce the construction period.
- Material stockpiles and waste debris piles should be located away from road way so as to prevent encumbrances.
- Traffic control devices such as signs, barriers, fences, lights should be provided and installed.
- Advance warning signs should be placed approximately 50 m before approaching site. Additional signs should be placed at intervals.
- Cones should be placed to demarcate construction and lane closure zone.
- Adequate number of flag persons should be provided during all periods of activities which may affect normal traffic flow.

- The Guyana Police Force to should be approached to have ranks present on site to assist in controlling traffic.
- The entire work zone for the bridge should be cordoned off.
- The construction zone should be lighted at night.
- Road users should be informed through the media of possible traffic disruption and the importance of exercising caution in order to minimize accidents.

6.3.9 Relocation and Displacement

As was indicated in Section 5 the realignment of the Cunha Canal to its original alignment will disrupt some of BCL operations which will require relocation. In addition, some of BCL infrastructure such as a fence will have to be relocated. Further, there may be some temporary relocation of utilities as a result of the construction of the bridge on the EBD Public Road. The following are some measures that can be implemented to reduce the effects of these impacts:

- BCL should be engaged and informed of the details and specifics of the project so as to take the necessary actions.
- BCL should be given adequate time to remove/relocate their infrastructure so as not to cause damages and severe disruptions.
- An agreement should be arrived at between BCL and MoA regarding compensation for relocation facilities and disruption of activities.
- Utility companies should be contacted prior to construction and a visit be made to determine the presence of service lines and the need for relocation.
- Any relocation necessary should be done prior to construction so as to not disrupt any of the services.
- Any lines temporarily relocated should be returned to its original alignment after construction activities.

6.4 Training

For effective implementation of the mitigation measures and for a safe and healthy work environment, it is important that training be provided to workers. Since the works will be executed by contractors it is necessary for the contractors to be aware of the environmental requirements. It is expected that the contractors inform their workers of these requirements and conduct training where necessary. Workers should be made aware of the requirements of the EMP and their role and responsibilities. A training programme should also be developed for potential emergencies and covering the areas of fire, accidents and fuel spills.

7.0 Monitoring Plan and Emergency Response Plan

7.1 Monitoring Plan

A monitoring plan is essential to ensure mitigation measures identified are adequately and effectively implemented. Monitoring is the responsibility of NDIA. Table 11 outlines the Monitoring Plan. Results from monitoring activities should be included in a Monitoring and Environmental Report.

Table 11: Monitoring Plan

Parameter	Locations	Frequency	Responsibility
Water Quality <ul style="list-style-type: none"> ▪ Total Suspended Solids (TSS) ▪ Total Dissolved Solids (TDS) ▪ Oil and Grease ▪ Total Metals 	<ul style="list-style-type: none"> ▪ Sample Location 1 ▪ Sample Location 2 	Quarterly	NDIA
Air Quality <ul style="list-style-type: none"> ▪ Visual Observation of Particulate Matter 	<ul style="list-style-type: none"> ▪ Around bridge and sluice construction 	Ongoing	NDIA
Noise	Around construction area	Monthly	NDIA
Waste Management <ul style="list-style-type: none"> ▪ Waste Management Plan ▪ Waste Accumulation and Disposal 	Entire Project Area	Monthly	NDIA
Health and Safety <ul style="list-style-type: none"> ▪ Emergency Response Plans, ▪ Management Programmes ▪ Health and Safety Programmes, ▪ Use of PPE 	Entire Project Area	Weekly	NDIA
Social Issues <ul style="list-style-type: none"> ▪ Conflicts BCL/Residents 	Main area of influence	On observance or as emerged	NDIA

7.2 Emergency Response

The objective of the Emergency Response Plan is the protection of workers, the public and the environment in the general area of influence of the project through the development of emergency response capabilities and systems. This Emergency Response Plan describes the general background issues of the types of emergency and actions required to be followed should an emergency occur during the mobilization and operational phase of the project. This Emergency Response Plan has identified the following key elements:

- Emergency Contact Details
- Emergency Procedures
- Authority of Control
- Identification of potential scenarios

All workers should be oriented to the Plan and the elements of the Plan should be reinforced on a regular basis with the conduct of emergency drills on a quarterly basis. A copy of the plan should be displayed at the construction site office.

7.2.1 Emergency Contact Details

There are key institutions and agencies that would need to be contacted in cases of emergencies. Table 12 outlines these key institutions relevant to this operation. This table should be displayed at the site office.

Table 12: Emergency Contact Details

Institutions	Contact Number
Environmental Protection Agency	225 0506
Ministry of Agriculture	225 5973
National Drainage and Irrigation Authority	225 5005
Ministry of Public Works and Communication – Works Services Group	226 0650
Guyana Police Force – Traffic Hotline	226 9809
Timehri Police Station	261 2222
Timehri Fire Station	261 2291
Guyana Defence Force – Timehri	261 2223

Institutions	Contact Number
Diamond Hospital	265 4683
Georgetown Hospital	227 8204
Barama Company Limited	225 4555

7.2.2 Emergency Response Philosophy

The emergency response procedure involved the following priorities for action:

- Protection of human health and safety;
- Protect and minimize the effect to the health and safety of animals;
- Contain the spread of material;
- Neutralize and render safe any noxious or hazardous materials; and
- Commence clean-up activities and site remediation.

By their very nature, emergency response procedures deal with events either not foreseen or almost totally unlikely. It is necessary therefore to plan for worst case scenarios or adopt general procedures, as normally anything that can be covered by a specific plan is not an emergency.

7.2.3. Authority of Control

The Project Manager has the authority to take control of any incident. However, onsite, the site Supervisor/Manager have that responsibility. These persons have the authority to take the decision to close down all or any part of the operations following an incident.

7.2.4 Emergency Procedures

The Site Supervisor/Manager has the authority to take control of any incident. He has the authority to take the decision to close down all or any part of the activities following an incident. The flow chart in Figure 15 outlines the procedures in responding to emergencies.

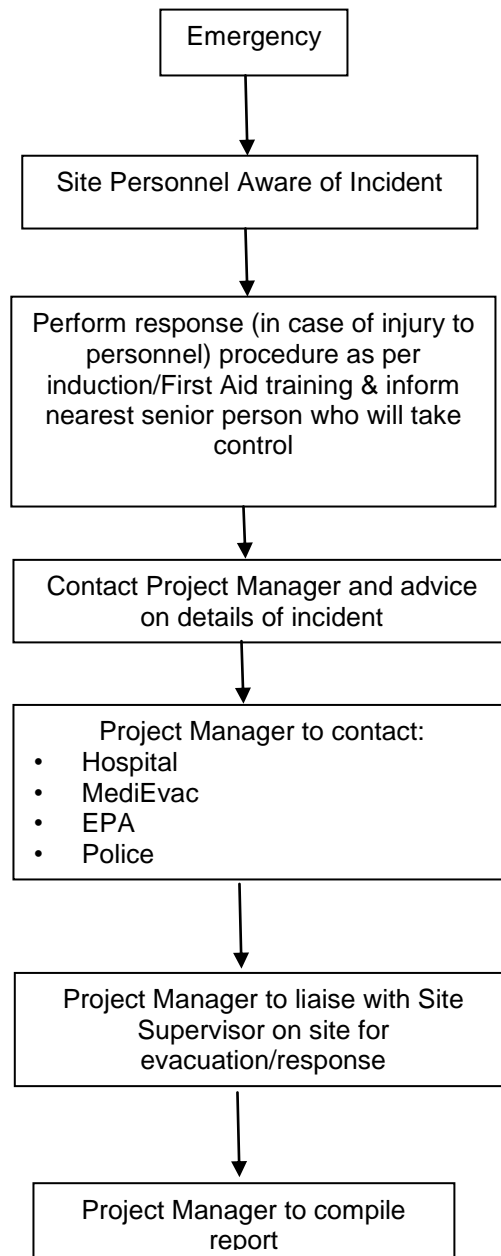


Figure 8: Flow chart showing the emergency response procedures

7.2.5 Minor Situations

Minor situations (excluding first aid) require some attention. When a minor incident occurs the Health and Safety personnel onsite should be informed and should arrange transport to medical facilities.

7.2.6 Major Situations

Major situations are those that require a comprehensive response. The following are five (5) possible scenarios that can occur during the execution of the project along with recommended emergency response procedures.

7.2.6.1 Major Accidents

The following actions should be undertaken if a major accident (involving heavy duty equipment, construction materials and workers) occurs:

1. Call the site office.
2. Give the details of the accident.
3. State, type of injury, i.e. broken leg, conscious or unconscious.
4. Onsite medical personnel to provide first response
5. Site Supervisor/Manager to arrange MedEvac and contact authorities.

7.2.6.2 Fuel Spills

In the event of a fuel spill covering more than 2m x 2m the following action will be taken:

1. Stop the flow if possible.
2. Notify the Supervisor and/or Manager.
3. Prevent the movement of people or vehicles into the immediate area.
4. Ensure that all activities are restricted in the vicinity to reduce any risk of ignition.
5. Treat the spill with absorbent material such as sand or sawdust and a bund formed if possible to prevent the spill spreading and contaminating soil and water.
6. Collect absorbent materials and place in a secured area.
7. Notify the EPA as soon as possible and seek guidance on disposal of absorbent material. An incident report should also be submitted to these agencies.

7.2.6.3 Fire

Firefighting equipment such as fire extinguishers and sand buckets should be located at strategic points within the project area such as fuel storage and re-fuelling areas. These strategic points should be clearly marked, be visible and workers should have knowledge of their position. In the event of a fire, workers should initiate the following procedure:

1. Immediately warn others and evacuate the area.
2. Rescue any person in immediate danger
3. Attack the fire if safe to do so, with firefighting equipment provided, but without taking personal risks.
4. Contact the Supervisor/Manager onsite who should then contact the Timehri Fire Station.
5. Take decisions on containment. If it is a small fire, use fire extinguisher (Dry chemical such CO₂ or Halon). In the event of a larger fire, employ water spray, fog or standard foam if available. In the event of a fuel fire, move container from fire area if possible without risk, cool containers that are exposed to flames with water from side until well after fire is out and stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
6. Should the fire become uncontrollable, all firefighting efforts are to be abandoned and efforts made to reach safety

7.2.6.4 Traffic Accidents

Construction of the bridge at the East Bank Public Road will pose the risk of traffic accidents since congestion would occur and heavy duty construction equipment will be in operation. If there is an accident the following procedures will be followed.

1. Inform site Supervisor/Manager.
2. In the case of injury, First Aid treatment to be applied.
3. Assess type of injury, i.e. broken leg, conscious or unconscious.
4. Arrange transportation to Diamond Hospital.
5. Contact Timehri Police Station.

7.2.6.5 Embankment Failure/Breach

Breaches can occur both during the construction and operational phases of the project. The NDIA has already in place a response mechanism to address this type of emergency. These measures are outlined in the East Demerara Water Conservancy Management Manual. In order to prevent such an emergency from occurring, continuous monitoring of the embankments and water level is done.

During the rainy season the following preventative measures are implemented:

- Outlets to be opened at 56.50 ft GD;
- Water levels must not exceed 58.50 ft GD; and
- Water level should be 57.50 at the end of the season.

Reporting procedures were also developed. Reporting is done via radio. The procedures are as follows:

- Gauge reader at Lama house reports to:
- Radio operator at Enmore and security personnel at Flagstaff or along the Conservancy dam reports to:
- Secretary of the EDWC at MoA reports to:
- NDIA

In the case of an emergency, this line of communication would be extended to include the Civil Defence Commission (CDC), the Office of the President and the Regional/Local Government bodies.

The following are the major types of emergencies that can occur:

- Slips of the embankment
- Collapse of a structure
- Piping
- Small breaches

The following emergency works will be done in response to a breach:

- Construction of a revetment
- Sealing of a structure
- Raising the earthen embankment

To facilitate emergency works a stockpile of materials will be maintained. This stockpile would include steel sheet pilings, king piles, walings, bolts and nuts. There would also be stockpiles of clay and over 10,000 polythene bags. Equipment and machinery would also be on standby.

7.3 Grievance Procedures

The existing grievance redress mechanism in place for project executed by the PIU will be adapted for the Cunha Channel rehabilitation. It will be used to address legitimate concerns of affected individuals and groups who consider themselves deprived of appropriate treatment under the project or otherwise.

The mechanism includes:

- (i) A recording and reporting system, including grievances filed both verbally and in writing,
- (ii) A designated staff with responsibility at various levels of governments, and;
- (iii) A timeframe to address the filed grievances.

This mechanism will be detailed in the sub-project safeguards documents. The functioning of the grievance redress mechanism will be regularly monitored and evaluated by the ASDU during project implementation. The mechanism is outlined in Table 13.

Table 13: Grievance Redress Mechanism

Grievance Redress Procedures	
Access Point	<ul style="list-style-type: none"> • The Minister of Agriculture holds weekly meetings with farmers each Wednesday. These meetings can also be opened to include the public at large but specifically communities living around the project area or affected by the project. • The Project Coordinator in the ASDU will also be accessible via telephone, email, and verbal communication and will be responsible for intake of any grievances. • This access point will be advertised through the Ministry's website or a signboard or other means. • The Permanent Secretary of the MoA shall be responsible for leading responses to grievances related to this project.
Grievance Log	<ul style="list-style-type: none"> • Grievances can be made verbally to the Minister and/or the designated representative of the Minister. In this case, the grievance shall be accurately documented and verified as a true account by a third party. • Grievances can be made in writing addressed to the Project Coordinator in the ASDU and copied to the NDIA, defined as a relevant authority in the Drainage and Irrigation Act, 2004. • All grievances must be signed and dated by the aggrieved person. • All grievance records shall be copied to the relevant authority as defined in the Drainage and Irrigation Act, 2004.
Assessment and Timeframe	<ul style="list-style-type: none"> • The ASDU should acknowledge within 5 working days, receipt of the complaint and should include notification of the period necessary to address the grievance to the aggrieved person. • If the aggrieved person does not receive a response within the agreed time or is not satisfied with the outcome, he/she can refer the matter to the NDIA Board for redress. • The NDIA Board should acknowledge within 10 working days, receipt of the letter of appeal and should include notification of the period necessary to address the appeal. • If the aggrieved person does not receive a response within the agreed time, or is not satisfied with the outcome he/she can refer the matter to the responsible Minister for redress. • If the aggrieved person is not satisfied with the outcome he/she can refer the matter to the Court of Law for redress. • The grievances should be categorized by type (environmental, compensation, resettlement etc.). The first assessment of the grievance should be conducted by a Grievance Committee comprising of the Permanent Secretary, the ASDU Project Coordinator, technocrats from the NDIA and the lawyer based in the Ministry of Agriculture. <ul style="list-style-type: none"> ▪ Where agreement is not reached at the level of the Grievance Committee, the steps outline above should be followed.
Resolution and Follow-up	<ul style="list-style-type: none"> • An Implementation Plan should be developed for resolution of grievances. Data should be shared with the World Bank (raw grievance and/or monthly reports). On the spot resolution should be encouraged. However, the process and results should be documented.

8.0 Conclusions and Recommendations

The proposed project, which involves the rehabilitation of the Cunha Canal and returning it to its original alignment, will be conducted in an already disturbed area. Most of the project activities such as the construction of the bridge and rehabilitation of the sluice will also be done in areas away from residents.

Impacts to the physical and biological environments will be minimal since the area is already densely inhabited, with a large number of domestic animals, therefore given the heavy anthropogenic interference; further habitat loss is likely to be minimal. Notwithstanding, all measures will be taken to limit impacts.

The major anticipated impacts of the project would be traffic disruption as a result of the bridge construction and relocation of some aspects of BCL Operation. These impacts are, however, unavoidable.

Measures are identified to mitigate the perceived impacts of the Project on the environment. These measures will have to be implemented by the Contractors and monitored by NDIA. The NDIA will have to ensure that the Contractors comply with the measures outlined in the EMP. Once these measures are properly implemented the impacts of the Project on the biophysical and socioeconomic environments should be minimal.

In this regard, the Consultant Team can recommend the execution of the Project, given that the measures recommended are implemented.

Appendix A – Terms of Reference

Terms of Reference

Environmental and Social Assessment Report for Rehabilitation of the Cunha Canal

1. Introduction

The Government of Guyana is preparing the engineering design and project implementation plan for the rehabilitation of the Cunha Canal to improve storm management discharge capacity from the East Demerara Water Conservancy (EDWC) to the Demerara River. The objective of the project is to restore the Cunha Canal to its original alignment, as it existed prior to the construction of the west bank road and restore its discharge capacity to provide additional relief capability for the management of conservancy water levels on a more timely basis.

The purpose of this study is to provide an Environmental/Social assessment of the proposed works in compliance with the requirements of the Government of Guyana and World Bank Safeguards.

This project is being implemented under the Conservancy Adaptation Project which is being funded by the Global Environment Facility Special Climate Change Fund.

2. Construction Works Description

Under the construction project, the GoG is considering the installation of a permanent bridge on the West Bank Road over the Cunha Canal alignment and the rehabilitation of the canal and koker system from the east side of the road to the Demerara river. During construction, a temporary bypass will be constructed around the bridge work site to accommodate road traffic during bridge construction. The project will occupy the existing NDIA right-of-way which passes through the Barama Lumber Company compound to the Demerara River. The existing Koker is to be rehabilitated which is located east of the old West Bank Road.

Under this effort, the consultant shall produce an Environmental/Social assessment for the works planned in accordance with requirements of the Guyana Environmental Protection Agency and World Bank Safeguard requirements.

3. Specific Requirements: Environmental/Social Assessment

The environmental/social assessment to be prepared under this contract shall provide an analysis of the potential impacts associated with the canal rehabilitation works and bridge construction. The assessment shall consider the physical, biological, and socio-economic impacts of the works and, in general, the positive and negative impacts associated with rehabilitating the historical canal alignment. The consultant shall consider the impact of additional discharge capacity on the operation of the East Demerara Conservancy, the local impacts associated with canal operation, and impacts associated with the construction phase of the works such as traffic control, noise management, waste and chemical products management as well as social implications associated with the reopening of the historical alignment.

Specifically, the consultant shall:

- Review proposed designs and construction plans
- Review upstream and downstream conditions
- Assess current social requirements for road access, including motor transport, pedestrian, and animal access (eg. Horse drawn carts, etc.)
- Review construction procedures for traffic and worker safety and identify any related issues.

- Meet with relevant parties to discuss perceived impacts of the works plan including Local community, the Barama Lumber Company, MoA, Ministry of Works, Police and emergency services and other parties identified during the execution of the study.
- Identify short-term reversible and non-reversible environmental impacts associated with construction and operation of the rehabilitated canal.
- Provide a mitigation plan for anticipated social and environmental impacts relating to the project.

The consultant shall produce an Environmental/Social Assessment report detailing the findings of the study which shall be based on the following outline and at a minimum include:

1. Executive Summary (English) of not more than 2 pages
2. Description of the works and alternatives considered
3. Legal framework including environmental, land use, water management and other related laws and regulations
4. Description of the Existing Environment
 - Physical
 - Biological
 - Socioeconomic
5. Analysis of Impacts including selection of the preferred options
 - Physical
 - Biological
 - Socioeconomic
6. Mitigation Analysis of the preferred option
7. Mitigation and EMP
8. Record of Consultations

9. Technical Annexes

This assessment shall be written in a concise manner in terms that can be readily understood by non-technical personnel and shall be organized to clearly present the positive and negative impacts of works identified. Technical supporting information shall be included in the technical annex of the report.

a. Public Consultation

During the development of this assessment, the contractor shall conduct meetings with the affected population, relevant government and non-government entities. A record of these meetings shall be summarized in the assessment and a written record of these meetings shall be contained in the annex section of the assessment report.

b. Public Comment

This report shall be delivered to the GoG and the World Bank for review. Additionally, the report shall be made available for public comment for not less than 30 days. At the conclusion of the public comment period, comments shall be reviewed and incorporated in the final environmental assessment document.

c. Relocation Plan

In the unlikely event that works require involuntary relocation, a relocation plan shall be developed pertaining to the affected sites. This plan shall be produced consistent with the Guyana national legal framework and shall conform to World Bank requirements for involuntary relocation.

4. Deliverables

A report containing the environmental and social assessment report and the EMP as presented in table 1

Table 1
Deliverables, Project level Environmental Assessment for the Cunha Outlet

Item	Deliverable	Format and Quantity	Delivery Date	Language
1	Environmental and Social Assessment Report	Printed draft and final copies, 10 each. CD version in MS Word format and Editable PDF format 10 copies draft; 20 copies final. Plans in approved electronic format (eg DWG, DXF)	To be delivered 5 weeks from inception	English

5. Period of performance

Special Requirements

In addition to the requirements set forth in these TORs the consultant shall comply with the requirements set forth under World Bank OP/BP 4.01, OP/BP 4,12, and Government of Guyana, Environmental Protection Agency requirements.

Appendix B - Records of Consultations

First Meeting/Consultation/Visit – Agricultural Sector Development Unit (ASDU)

Date:	November 23, 2009
Representatives:	<p>EMC Mr. Khalid Alladin – Projects Manager</p> <p>ASDU Mr. Joslyn McKenzie – Project Coordinator Mr. Frederick Flatts – Project Engineer</p>
Venue:	ASDU Office, Ministry of Agriculture Building
Objectives:	The objective of this first meeting/consultation was for EMC to gain an in-depth understanding of the project and collect any available background data.
Discussions:	<p>The meeting commenced at 13:30 hrs and the EMC representative outlined the purpose of the meeting. After this the representatives from ASDU proceeded to provide a background to the project and the details regarding the activities to be undertaken. Several pieces of information were provided by ASDU to EMC at this meeting. These include:</p> <ul style="list-style-type: none"> ▪ A Project Document ▪ Designs for the Bridge and Sluice ▪ Cross Sections of the Canal ▪ No Objection Letter from Ministry of Public Works and Communications regarding the construction of the bridge ▪ No Objection Letter from Barama Company Limited (BCL) regarding the realignment of the Canal through their property <p>At the meeting it was indicated to ASDU that a site visit was necessary to gather a full understanding of the project. ASDU agreed to organize an initial site visit for November 26, 2009.</p>
Next Steps:	ASDU to organize initial site visit to the project area.

Second Meeting/Consultation/Visit - ASDU and National Drainage and Irrigation Authority (NDIA)

Date:	November 26, 2009
Representatives:	<p>EMC Mr. Khalid Alladin – Projects Manager</p> <p>ASDU Mr. Joslyn McKenzie – Project Coordinator Mr. Frederick Flatts – Project Engineer</p> <p>NDIA Mr. Lionel Wordsworth – Chief Executive Officer</p>

Venue:	Project area – Land of Canaan
Objectives:	The objective of this initial visit was for EMC to have an understanding of how the project fits on the ground and to determine potential impacts and areas that would be affected.
Discussions:	<p>The visit commenced at 13:00 hrs and was concentrated on the main area to be influenced/affected by the project activities. On the site the ASDU and NDIA personnel provided:</p> <ul style="list-style-type: none"> ▪ A general overview of the function and alignment of the existing canal. The following areas were also visit: <ul style="list-style-type: none"> ○ The diverted canal – This diversion runs parallel along the East Bank Demerara Public Road and is cleared of vegetation. ○ The current sluice – This sluice is located between Sara Johanna and Land of Canaan and serves to control the discharge of water from the Canal as well as prevents water from the Demerara River entering the Canal. It was indicated that this sluice is not fully operational. ○ The current discharge channel to the Demerara River. This channel was very narrow, there were encroachment on both sides and it was clogged with vegetation. ▪ A general overview of the proposed project and the activities to be undertaken. The following areas were also visited: <ul style="list-style-type: none"> ○ The site for the construction of the bridge on the Land of Canaan Public Road - At this site the areas for stockpiling of construction materials and waste were identified. The area for the construction of the temporary bypass for vehicular traffic was also identified. ○ The old canal alignment between the Public Road and the BCL Compound – This old alignment will be rehabilitated to facilitate the re-routing of the Canal. The current situation of the canal was observed, especially regarding the presence of vegetation which will have to be removed. It was also determined that a fence on the southern boundary of BCL Compound running parallel to this alignment will have to be relocated further away to facilitate construction activities and the embankment of the canal. ○ The old sluice – this sluice will be rehabilitated to serve as the control sluice for the Canal. The condition of the sluice was observed. It was pointed out that the structure of the sluice is in good condition and as such there is no need to construct a new sluice. From the sluice the likely alignment of the Canal through the BCL Compound was observed. However, a visit within the Compound was not possible at the time. ASDU/NDIA has agreed to arrange a visit to this area. <p>EMC representative indicated to the ASDU Personnel that visits to the entire alignment of the Canal and within the BCL Compound were necessary. ASDU committed to organize these visits.</p>
Next Steps:	ASDU to organize visits within BCL Compound and along the alignment of the Canal.

Third Meeting/Consultation/Visit - NDIA

Date:	December 05, 2009
Representatives:	<p>EMC Mr. Khalid Alladin – Projects Manager Mr. Lakshman Persaud – Social Expert</p> <p>NDIA Mr. Surrendra Singh – Engineer Mr. Raul Jaisingh - Drainage and Irrigation Worker – Land of Canaan Canal</p>
Venue:	Project area – Land of Canaan
Objectives:	The objective of this visit was for EMC to have an understanding of how the project fits on the ground and to determine potential impacts and areas that would be affected.
Discussions:	<p>The visit commenced at 09:00 hrs and was concentrated on the area of the Canal between the East Demerara Water Conservancy (EDWC) and the East Bank Demerara Public Road.</p> <p>A general overview of the functioning of this section of the Canal was presented. The entire alignment was surveyed and the sluice at the EDWC was visited. No major work is required on this sluice. It should be noted that at the time of the visit there were no discharge from the EDWC to the Canal since the water level in the Conservancy was quite low. Both the Canal and the embankment.</p> <p>The general areas to be affected by the project were also observed including the areas on both sides of the alignment which will be affected by the widening of the Canal. A private housing scheme under construction was observed on the area north of the Canal. The vegetation to be impacted was also surveyed. The southern half of the Canal and southern embankment were quite cleared of vegetation while the northern half of the Canal had some vegetation present. The northern embankment of the Canal has a high presence of vegetation. Water samples were collected at points along the Canal. These samples would be analysed to determine the water quality at the time of the visit. Closer to the public road, housing facilities for workers of Barama Company Limited were observed on both sides, though some distance away.</p> <p>An area of concern identified during the visit was the presence of persons catching birds and fishing within the Canal and Conservancy areas. Boats were present in both waterways which support these activities. Fires were lit on the embankments which can affect its integrity and can result in breaches.</p>
Next Steps:	ASDU to organize visit within BCL Compound

Fourth Meeting/Consultation/Visit – Mr. Ravi Narine - Former Chief Executive Officer of NDIA

Date:	December 11, 2009
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Representatives:	<p>EMC Mr. Khalid Alladin – Projects Manager</p> <p>Others Mr. Ravi Narine – Engineer and former CEO of NDIA</p>
Venue:	Mr. Narine's Office – Lamaha Street, Georgetown
Objectives:	Since EMC had encountered difficulties regarding the collection of background information on the Canal it was decided to consult Mr. Ravi Narine since he was involved in Drainage and Irrigation activities for a number of years.
Discussions:	<p>The meeting commenced at 14:00hrs and the EMC personnel outlined the purpose to the meeting to Mr. Narine.</p> <p>Mr. Narine then indicated that, from his knowledge, there is hardly any written information on the Canal, and if there are, he is not sure where to locate those. He however indicated that the Canal was constructed just after the construction of the East Demerara Water Conservancy over one hundred and forty (140) years ago. He further indicated that the Canal formed part of the Conservancy construction and was previously used to discharge water from the Sand Hills area of the Conservancy. This catchment area was diverted to this section of the Conservancy.</p> <p>Mr. Narine was also asked about potential environmental implications of the proposed project. He indicated that he does not foresee any potential long term environmental impacts of the project since the Canal has been in existence for a while and the project merely entails rehabilitation and realigning this Canal. However, he indicated that there will be short term impacts resulting from construction activities which will require some form of mitigation.</p>

Fifth Meeting/Consultation/Visit – BCL

Date:	December 15, 2009
Representatives:	<p>EMC Mr. Khalid Alladin – Projects Manager</p> <p>ASDU Mr. Frederick Flatts – Project Engineer</p> <p>NDIA Mr. Lionel Wordsworth – Chief Executive Officer</p> <p>Barama Company Limited Mr. Charran – Factory Manager Mr. Mahendra Budhram – Assistant Forest Planning Manager Mr. Shameer Ali – Engineer Mr. Rajendra Ragnauth – Supervisor Mr. Neil Chand – Forest Planning Manager (consulted via telephone)</p>
Venue:	BCL Compound - Land of Canaan

<p>Objectives:</p>	<p>The objective of meeting/visit was to observe where the Canal alignment would fall within the Company's Compound and to determine the areas that would be affected. EMC also wanted to determine the concerns the Company have regarding the Project.</p>
<p>Discussions:</p>	<p>The visit/meeting commenced at 13:30 hrs within the Compound of the Company. The Company indicated to EMC that they are aware of the Project and was previously consulted by the NDIA. However, they have indicated that they are not sure of the exact alignment within their Compound and in this regard, are not sure of exactly how they will be affected.</p> <p>The team then proceeded to determine the alignment since the Canal was to follow its original alignment through the property. The proposed alignment was not marked. During this exercise, it was observed that there is a turn in alignment of the Canal. This turn will affect the Project since the main objective was to straighten out the Canal to allow for a free flow of water.</p> <p>If the Canal is to be realigned in a straight line from the sluice to the Demerara River, then a secondary processing facility and a large dust containment bin will have to be relocated. The Company has some concerns in this area in terms of the cost of relocating the processing equipment and the shed. In this regard, the Company requested a diversion of the Canal to bypass these facilities and flow in an angle towards the Demerara River. In this regard, only the Company's log pond would be affected. In both situations, the Company will be required to construct a bridge over the proposed Canal to link its log pond and storage facility to the processing facilities.</p> <p>It was recommended and agreed upon that both of the alignments proposed should be surveyed and marked on the ground. After that a proper evaluation of the effects regarding relocation, etc. would be done and the better option would be selected. NDIA indicated that their surveyors would proceed to mark the alignments.</p> <p>The Company indicated that it also has a concern regarding erosion. Most of the area within the Compound where the Canal will be aligned was filled with wood waste including saw dust. These areas were compacted. However, the rehabilitation exercise will disturb these materials and the flow of water can contribute to significant erosion. As a result, the Company is recommending that revetments be placed in these areas where necessary to avoid erosion of the embankments.</p>
<p>Next Steps:</p>	<p>NDIA to mark both proposed alignments of the Canal through BCL Compound after which another visit/meeting will be done to determine the impacts and to select the better option.</p>

Sixth Meeting/Consultation/Visit – Caledonia – Good Success Neighbourhood Democratic Council (NDC)

Date:	December 15, 2009
Representatives:	<p>EMC Mr. Khalid Alladin – Projects Manager</p> <p>ASDU Mr. Frederick Flatts – Project Engineer</p> <p>NDC Mr. Dwarka Nauth – Chairman Mr. Rangunandan Singh – Overseer Mr. Thomas Munroe - Councillor</p>
Venue:	NDC Office, Craig, East Bank Demerara
Objectives:	The objective of this meeting was to solicit the views and concerns of the NDC regarding the Project since the Project is located within this NDC District and may have implications for Drainage and Flooding.
Discussions:	<p>The meeting commenced at 15:30 hrs and a background of the Project was presented by the ASDU to the NDC. The EMC representative then outlined the purpose of the meeting indicated that EMC would like to have an indication of the concerns of the NDC regarding the Project so that these concerns can be addressed in the Environmental Assessment currently being conducted.</p> <p>The NDC indicated that they are aware of the Project and was previously consulted in the planning stage. They have also indicated that they are very supportive of the project since it would allow for the realignment of the Cunha Canal. The NDC indicated that it was against the diversion of the Canal in the first place since there was a possibility that the flow of water will be affected. The NDC is also of the view that a significant amount of water can be drained from the East Demerara Water Conservancy through the East Bank area. However, for this to be possible, some work will have to be done within the Conservancy to allow more water to flow to that section.</p> <p>The NDC indicated that they do not foresee any long term potential impacts of the project on the environment, but some impacts would occur during the construction phase and these should be mitigated.</p>
Next Steps:	The NDC has indicated that it will send a correspondence to ASDU indicating its support for the Project. ASDU has agreed to share a copy of the letter with EMC.

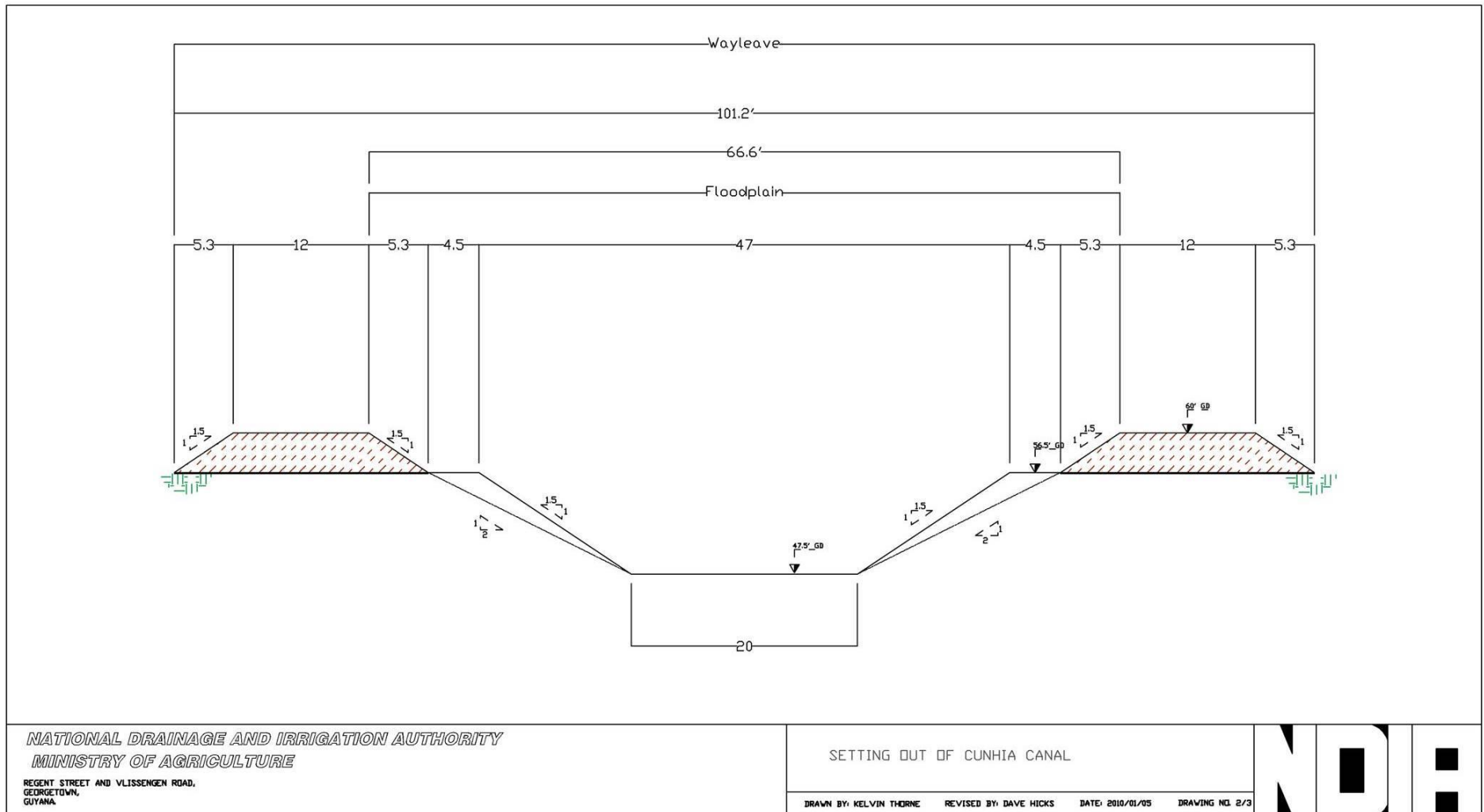
Seventh Meeting/Consultation/Visit – BCL

Date:	January 28, 2010
Representatives:	<p>EMC Mr. Khalid Alladin – Projects Manager</p> <p>ASDU</p>

	<p>Mr. Joslyn McKenzie – Project Coordinator Mr. Frederick Flatts – Project Engineer</p> <p>NDIA Mr. Kelvin Thorn – Engineer Mr. O Chandan – Corporate Secretary</p> <p>Barama Company Limited Mr. Mahendra Budhram – Assistant Forest Planning Manager Mr. Shameer Ali – Engineer</p>
Venue:	BCL Boardroom - Land of Canaan
Objectives:	The objective of meeting/visit was to present the proposed alignment of the canal, including the areas within BCL Operation which would be affected.
Discussions:	<p>The meeting commenced at 14:30 hrs in the Boardroom of the Company. The objective of the meeting was outlined by the ASDU who also presented a map to the Company outlined the alignment of the Canal and the structures that would be affected.</p> <p>It was indicated that the main building to be affected would be the Secondary Processing Shed. This is a large shed that house several pieces of equipment. Other areas to be affected include a fence on the southern boundary of the compound, a guard hut and a generator shed. Two (2) bridges that link the Company's log pond with the rest of the operation will also be affected.</p> <p>After this presentation, the Company queried whether a diversion of the Canal after the sluice to avoid the Secondary Processing Shed was considered. ASDU responded by indicating that this option was considered, but not agreed upon for the following reasons:</p> <ul style="list-style-type: none"> • The diversion would result in a loss of energy since the water would have to flow through a sluice then a turn. • Since there will be a heavy flow of water during the rainy season there is the possibility of erosion at the turn, especially since the material in that area is loose, consisting mainly of wood waste. • A diversion will still pass through the Company's log pond, thus disrupting operations. <p>Given the above response BCL outlined the following concerns.</p> <ul style="list-style-type: none"> • The Secondary Processing Shed is an integral part of the Company's operation, housing several pieces of equipment. Relocation of this shed would be costly, since a new shed will have to be constructed and all the equipment relocated. • The Company supplies external markets with products from this operation. The relocation activities will disrupt this operation, resulting in downtime and affecting the Company's ability to fulfill its market. The disruption will also result in a loss of revenue to the Company during the relocation period. • A number of employees will be affected by this disruption. The Company indicated that it will have to continue paying a salary to these workers during the period of disruption. • The Company requested that the metal bridge over the existing

	<p>Canal be maintained since it is in good condition, and also, the removal of both bridges will severely affect the Company's operation. It should be noted that after the meeting the bridge was visited and examined to determine a way forward. Measurements were also taken. Further analysis of this is required.</p> <ul style="list-style-type: none">• The Company indicated that it can handle the other areas to be affected and the relocation activities. <p>In this regard the Company requested:</p> <ul style="list-style-type: none">• Some more time to study the proposed canal effects on its operation and to discuss with senior officials of the Company.• Some form of compensations/assistance be provided by the Government to assist with the relocation and disruption. <p>Given this request, the meeting agreed that:</p> <ul style="list-style-type: none">• An official response be submitted by the Company to the Ministry of Agriculture by February 01, 2010.• The response would outline the estimated cost for relocation and disruption of activities.
Next Steps:	BCL to submit official response to the Ministry of Agriculture by February 01, 2010.

Appendix C – Cross Section of the Proposed Canal



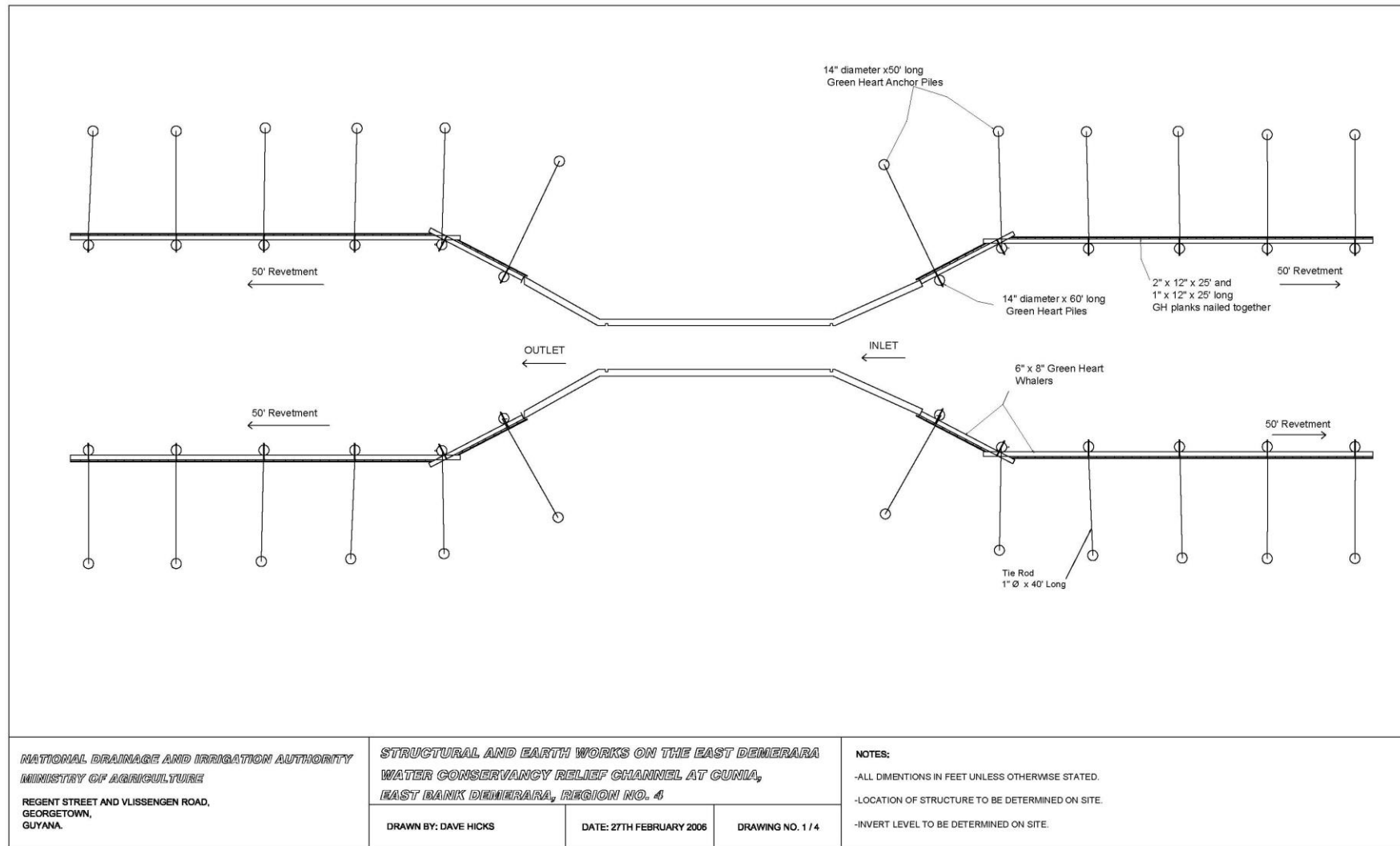
NATIONAL DRAINAGE AND IRRIGATION AUTHORITY
MINISTRY OF AGRICULTURE
 REGENT STREET AND VLISSENGEN ROAD,
 GEORGETOWN,
 GUYANA.

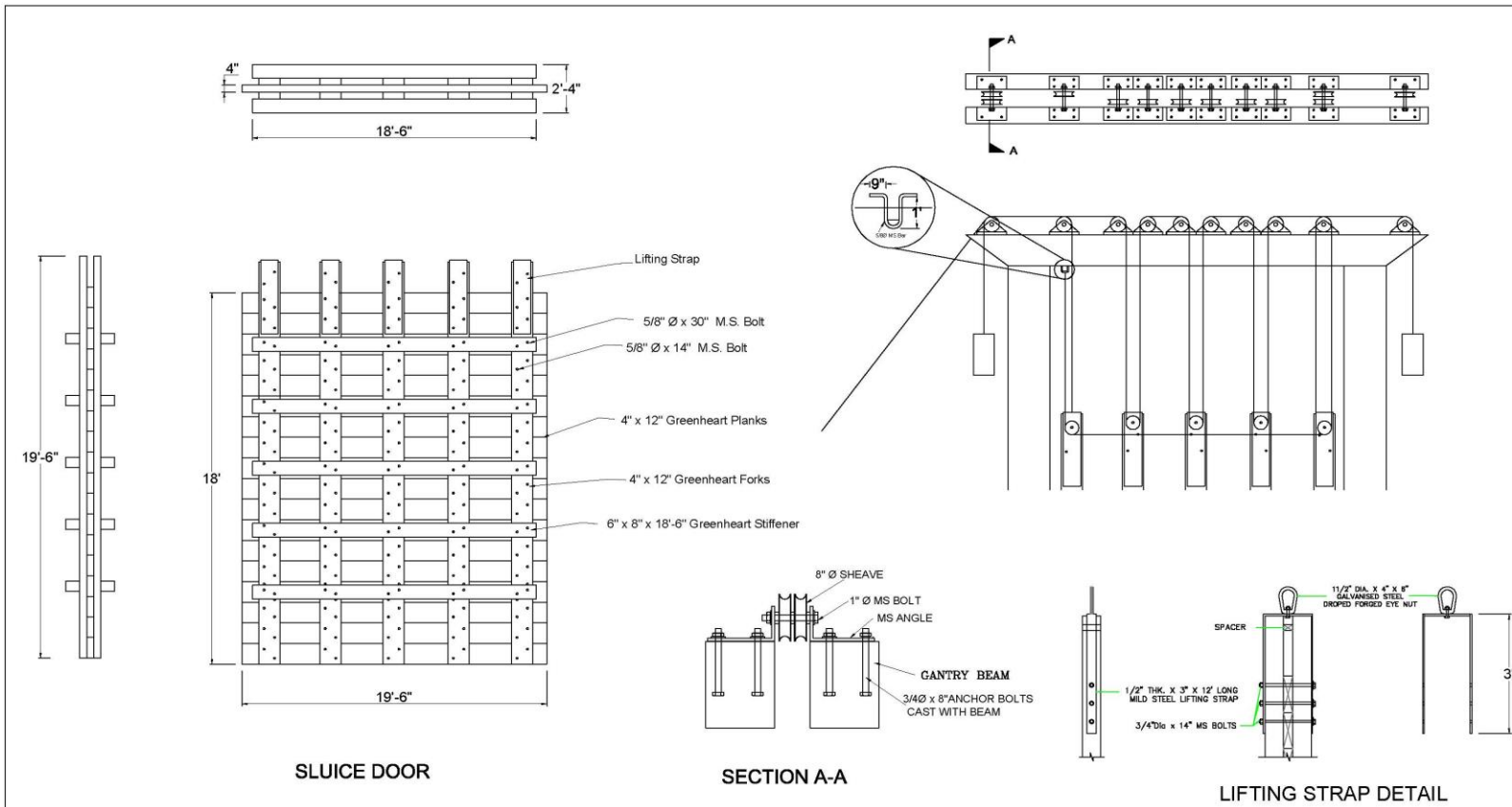
SETTING OUT OF CUNHIA CANAL

DRAWN BY: KELVIN THORNE REVISED BY: DAVE HICKS DATE: 2010/01/05 DRAWING NO. 2/3



Appendix D – Drawings of the Sluice to be rehabilitated





Drawings Not to Scale

NATIONAL DRAINAGE AND IRRIGATION AUTHORITY
 MINISTRY OF AGRICULTURE
 REGENT STREET AND VLISSENGEN ROAD,
 GEORGETOWN,
 GUYANA.

STRUCTURAL AND EARTH WORKS ON THE EAST DEMERARA
 WATER CONSERVANCY RELIEF CHANNEL AT GUNIA,
 EAST BANK DEMERARA, REGION NO. 4

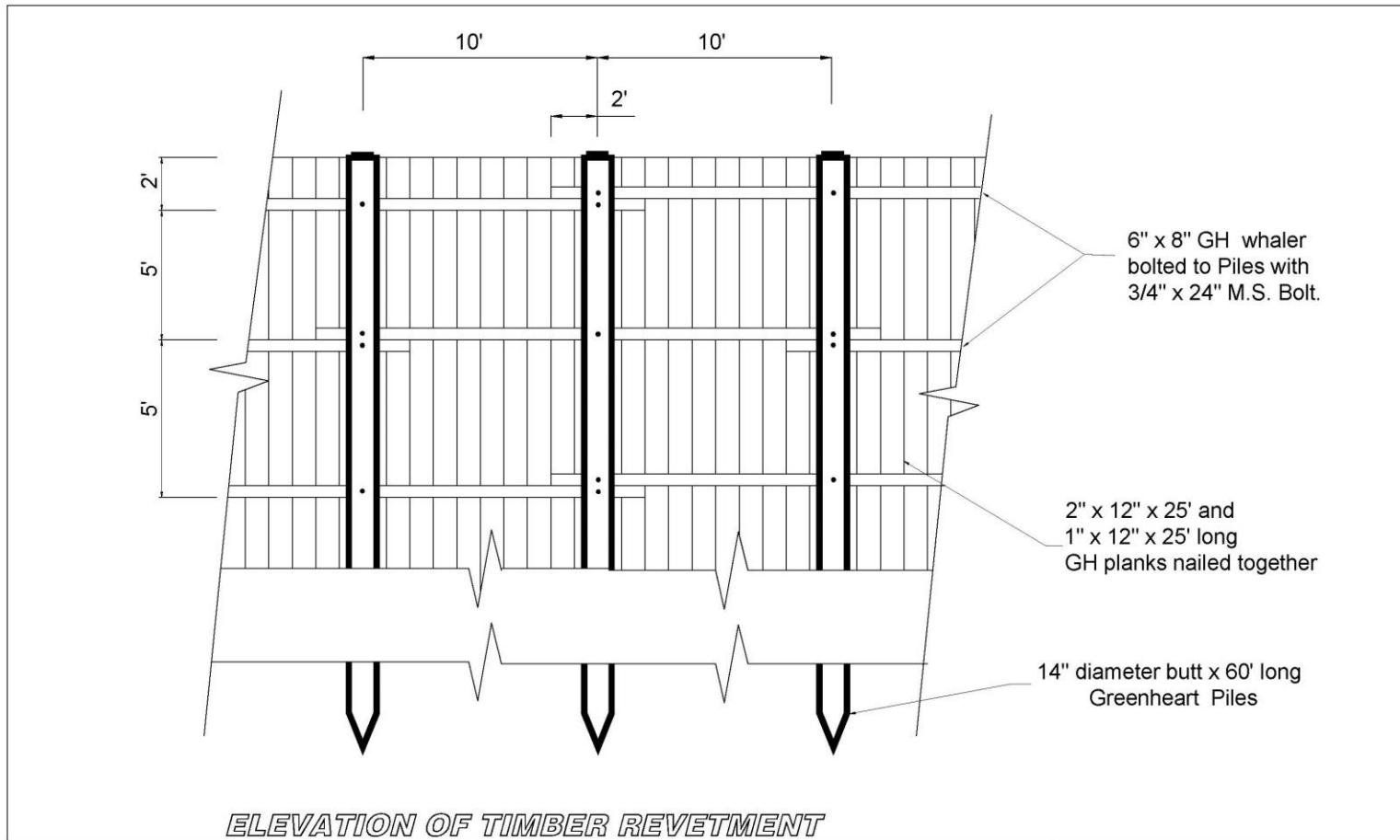
DRAWN BY: DAVE HICKS

DATE: 27TH FEBRUARY 2006

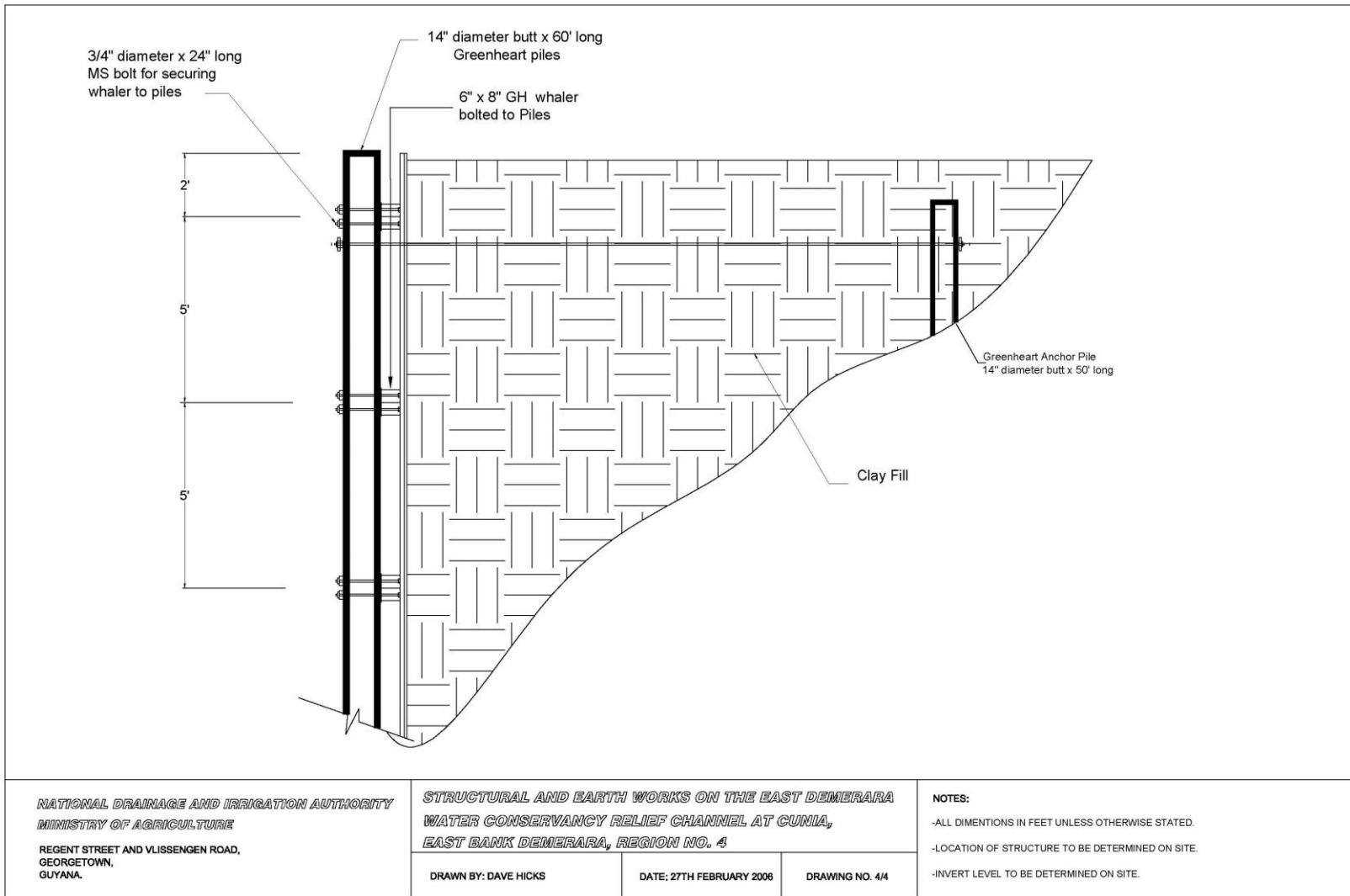
DRAWING NO. 2/4

NOTES:

- ALL DIMENSIONS IN FEET UNLESS OTHERWISE STATED.
- LOCATION OF STRUCTURE TO BE DETERMINED ON SITE.
- INVERT LEVEL TO BE DETERMINED ON SITE.

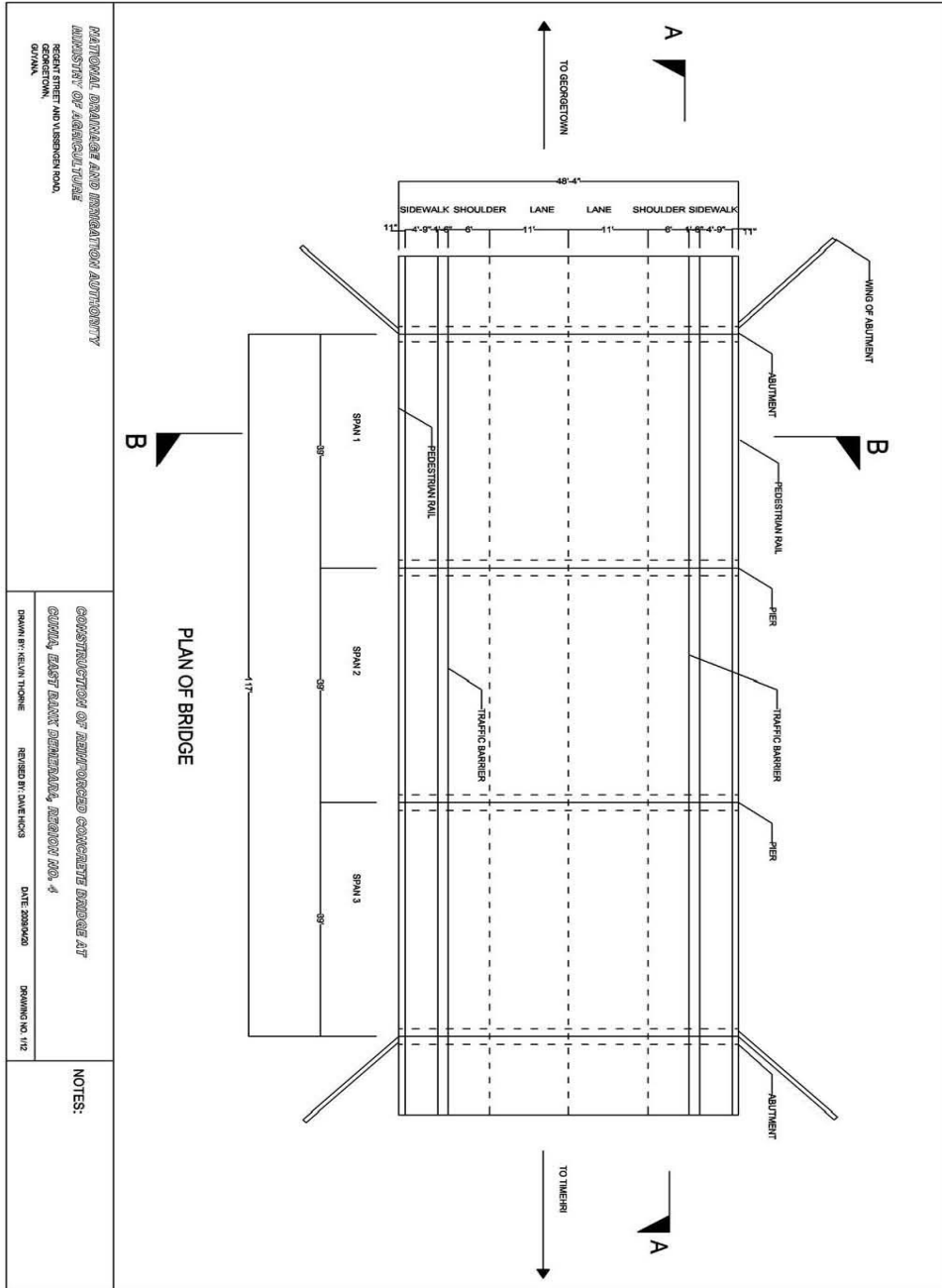


<p>NATIONAL DRAINAGE AND IRRIGATION AUTHORITY MINISTRY OF AGRICULTURE REGENT STREET AND VLISSENGEN ROAD, GEORGETOWN, GUYANA.</p>	<p>STRUCTURAL AND EARTH WORKS ON THE EAST DEMERARA WATER CONSERVANCY RELIEF CHANNEL AT GUNIA, EAST BANK DEMERARA, REGION NO. 4</p>		<p>NOTES: -ALL DIMENTIONS IN FEET UNLESS OTHERWISE STATED. -LOCATION OF STRUCTURE TO BE DETERMINED ON SITE. -INVERT LEVEL TO BE DETERMINED ON SITE.</p>
	<p>DRAWN BY: DAVE HICKS</p>	<p>DATE: 27TH FEBRUARY 2006</p>	

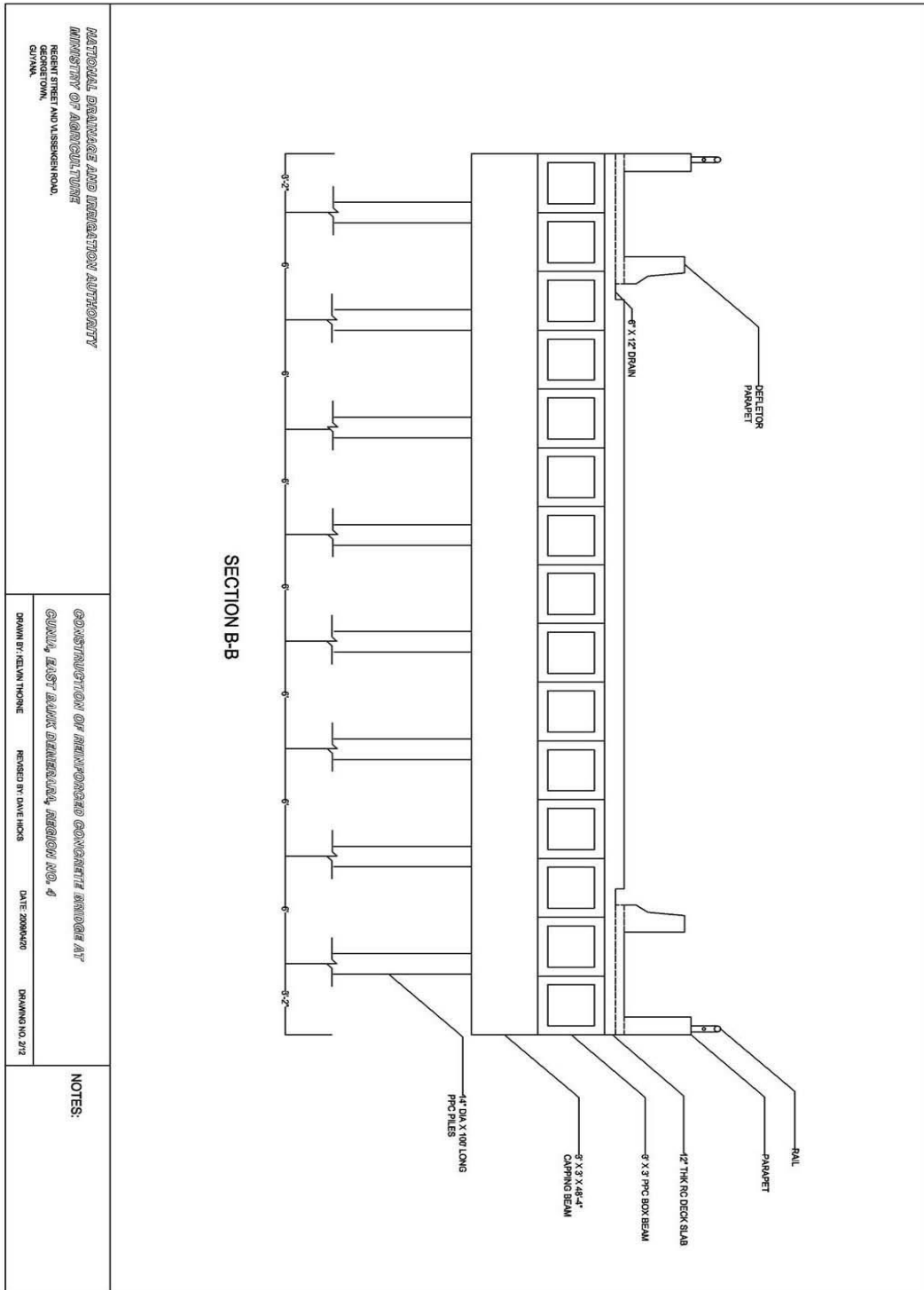


Appendix E – Drawings of the Bridge to be constructed

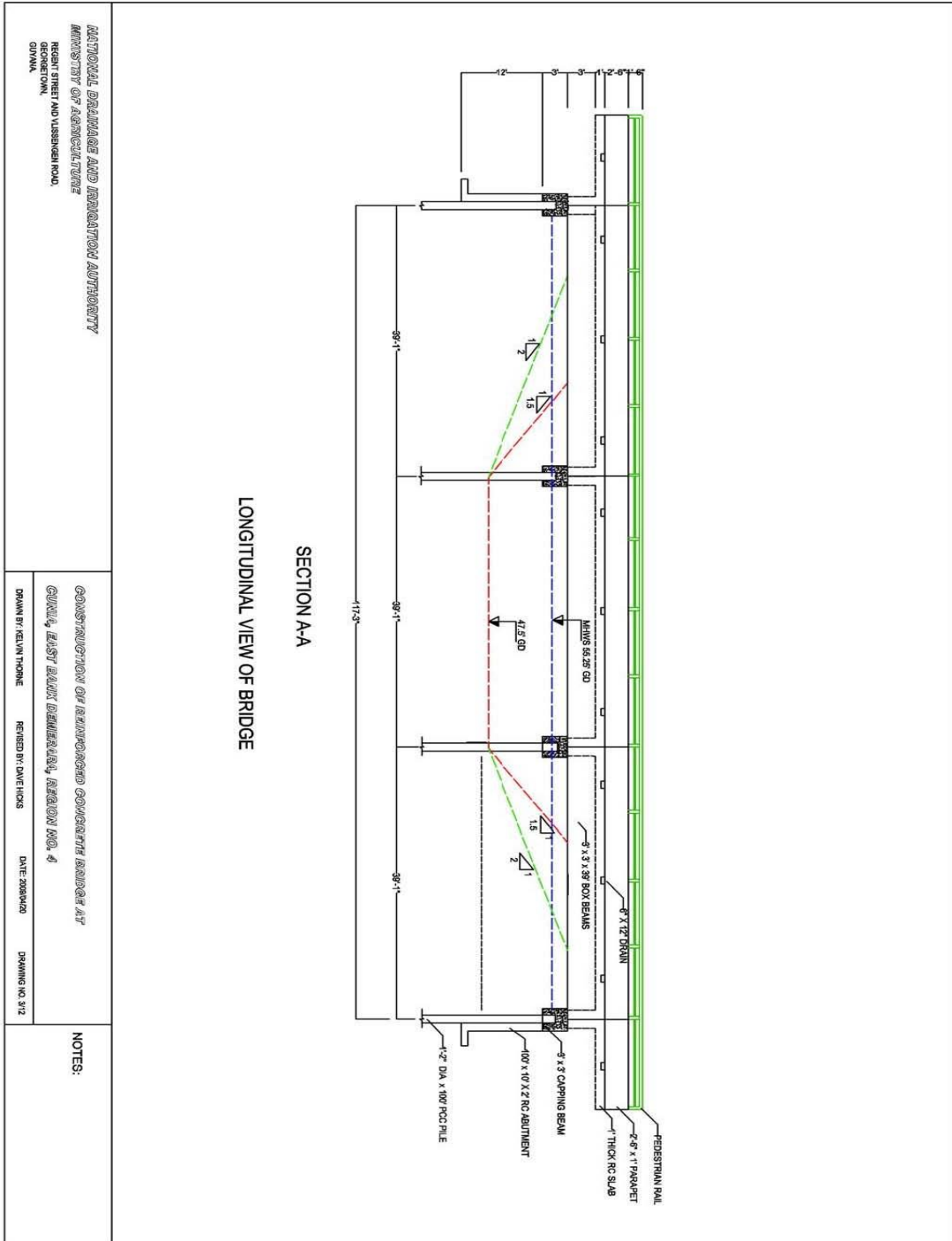
Plan of Bridge



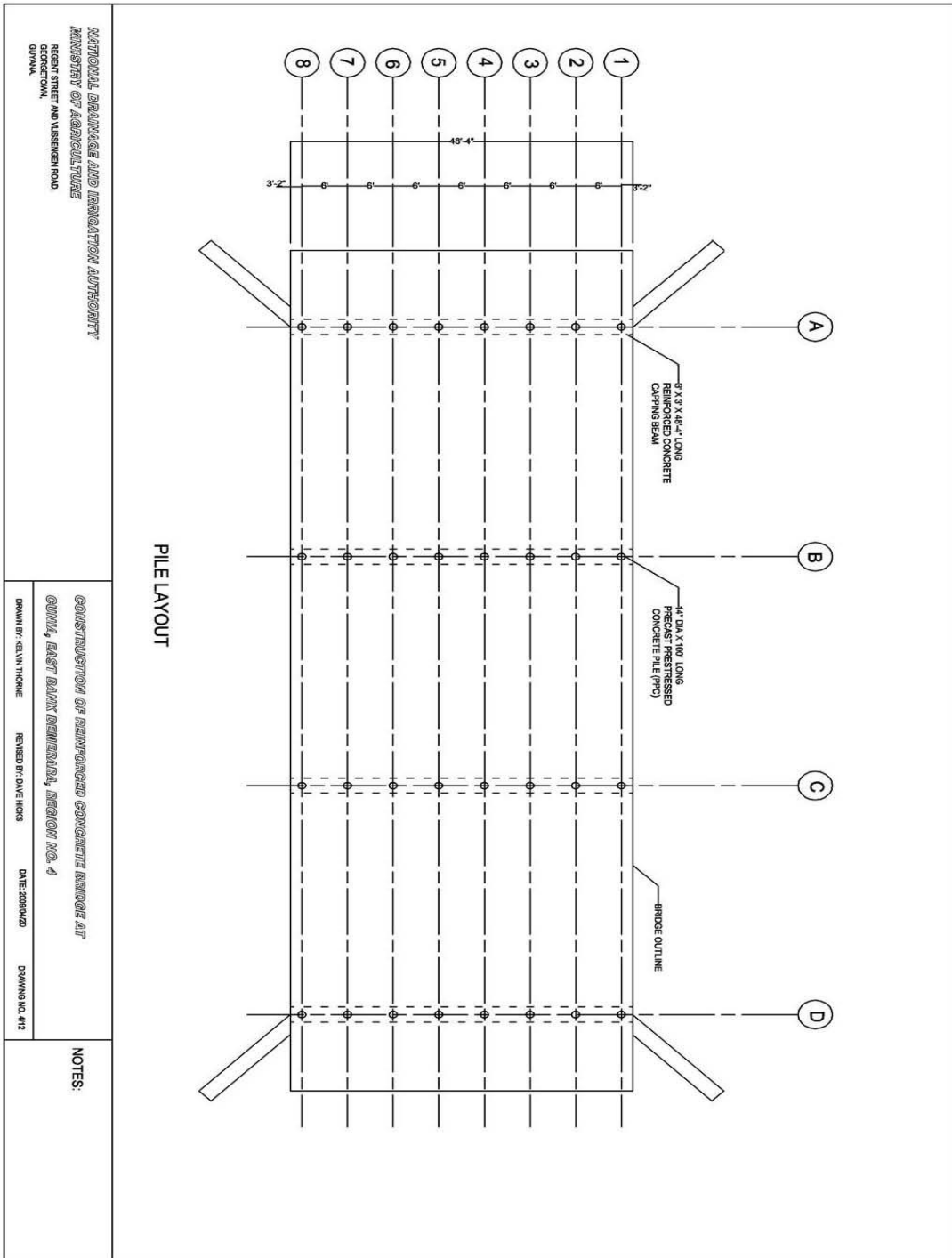
Transverse Section



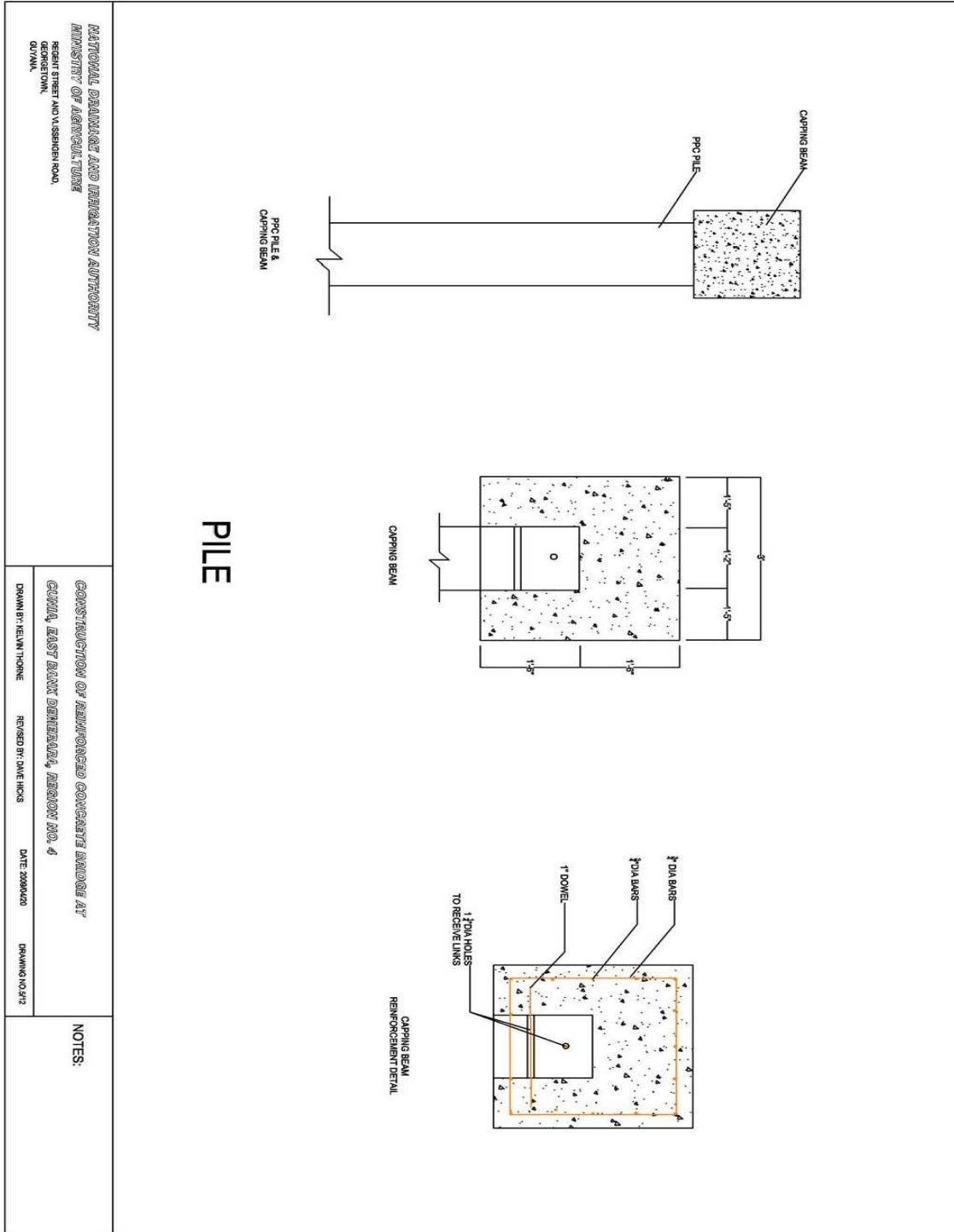
Longitudinal Section



Pile Layout



Pile detail

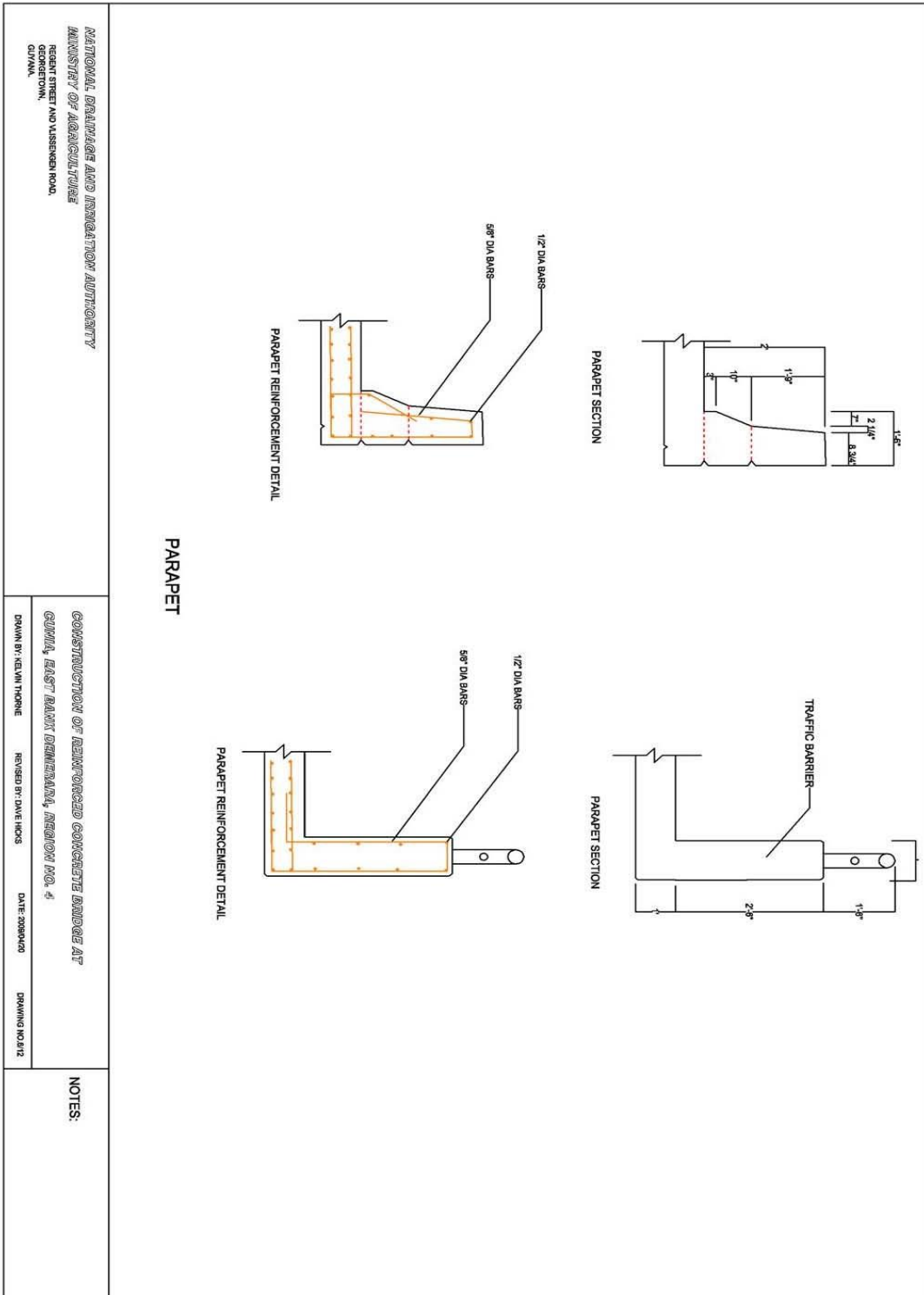


NATIONAL PLANNING AND IRRIGATION AUTHORITY
 MINISTRY OF AGRICULTURE
 ROBERT STREET AND VASSERON ROAD,
 GOSWELTON,
 QU/VA.

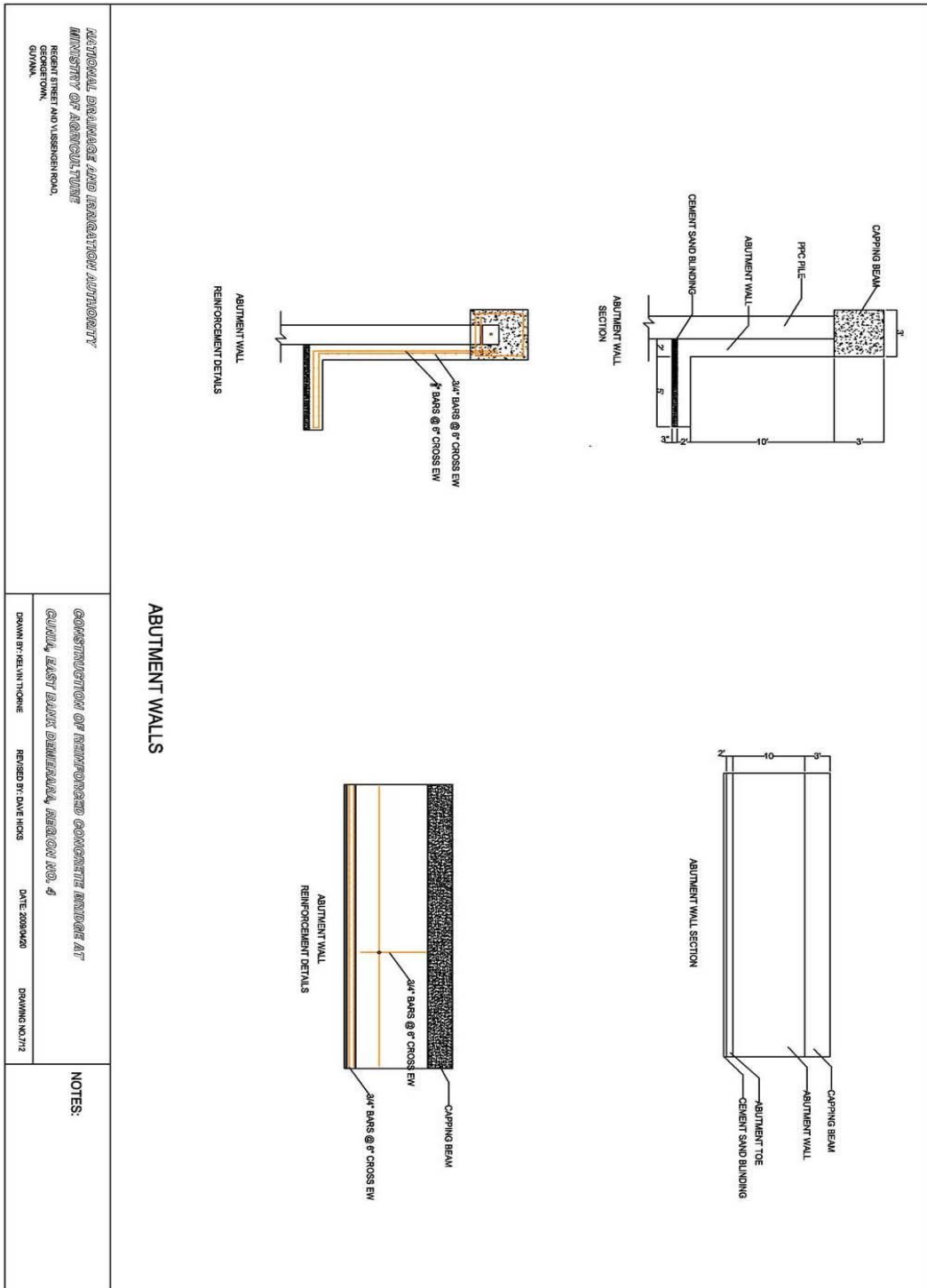
CONSTRUCTION OF IMPROVED CONCRETE BRIDGE AT
 CUNHA EAST BANK DAMBARRA, ZONE NO. 4
 DRAWN BY: KEVIN THORNE REVISED BY: DAVID HICKS DATE: 2009/02/20 DRAWING NO: 512

NOTES:

Parapet



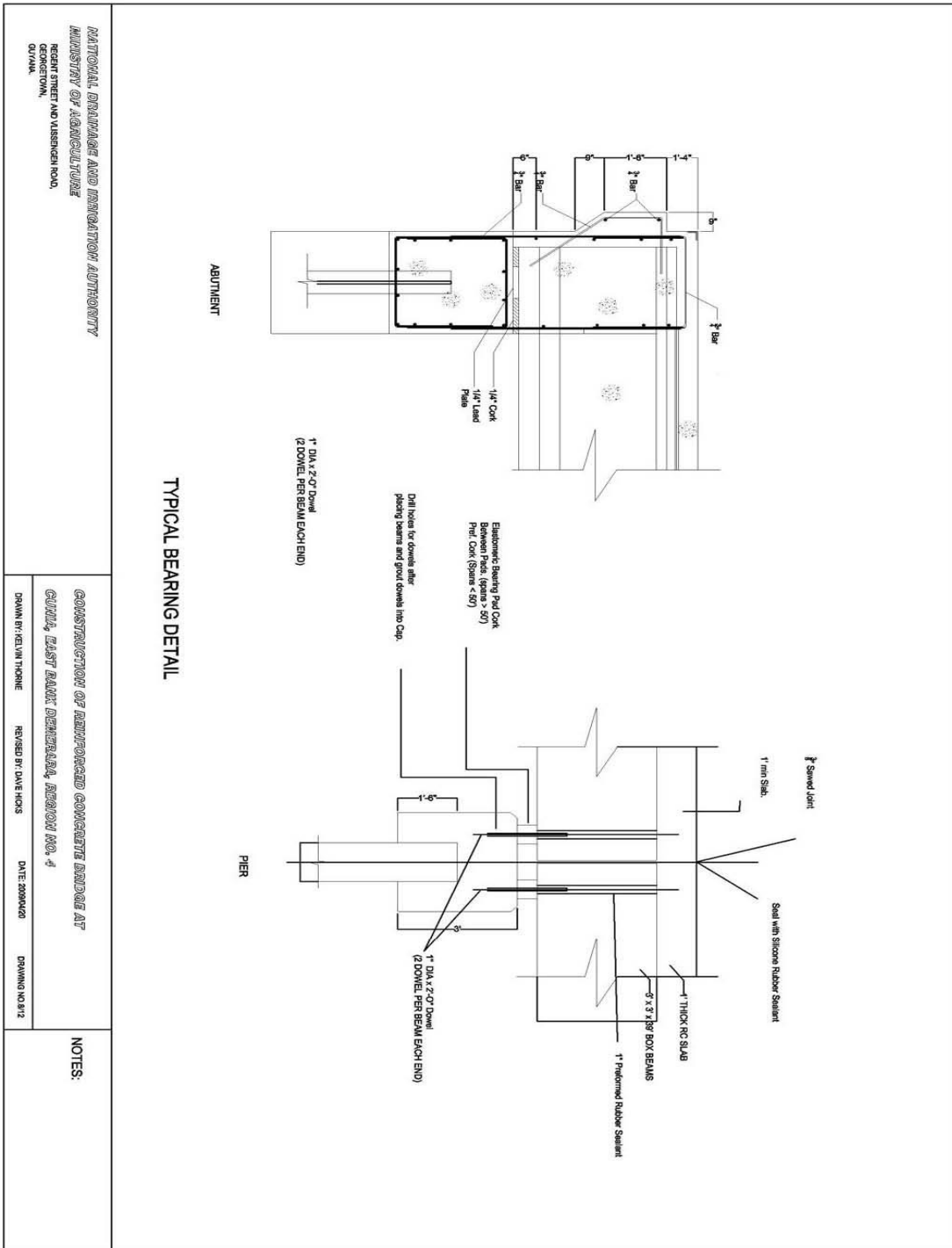
Abutment Wall



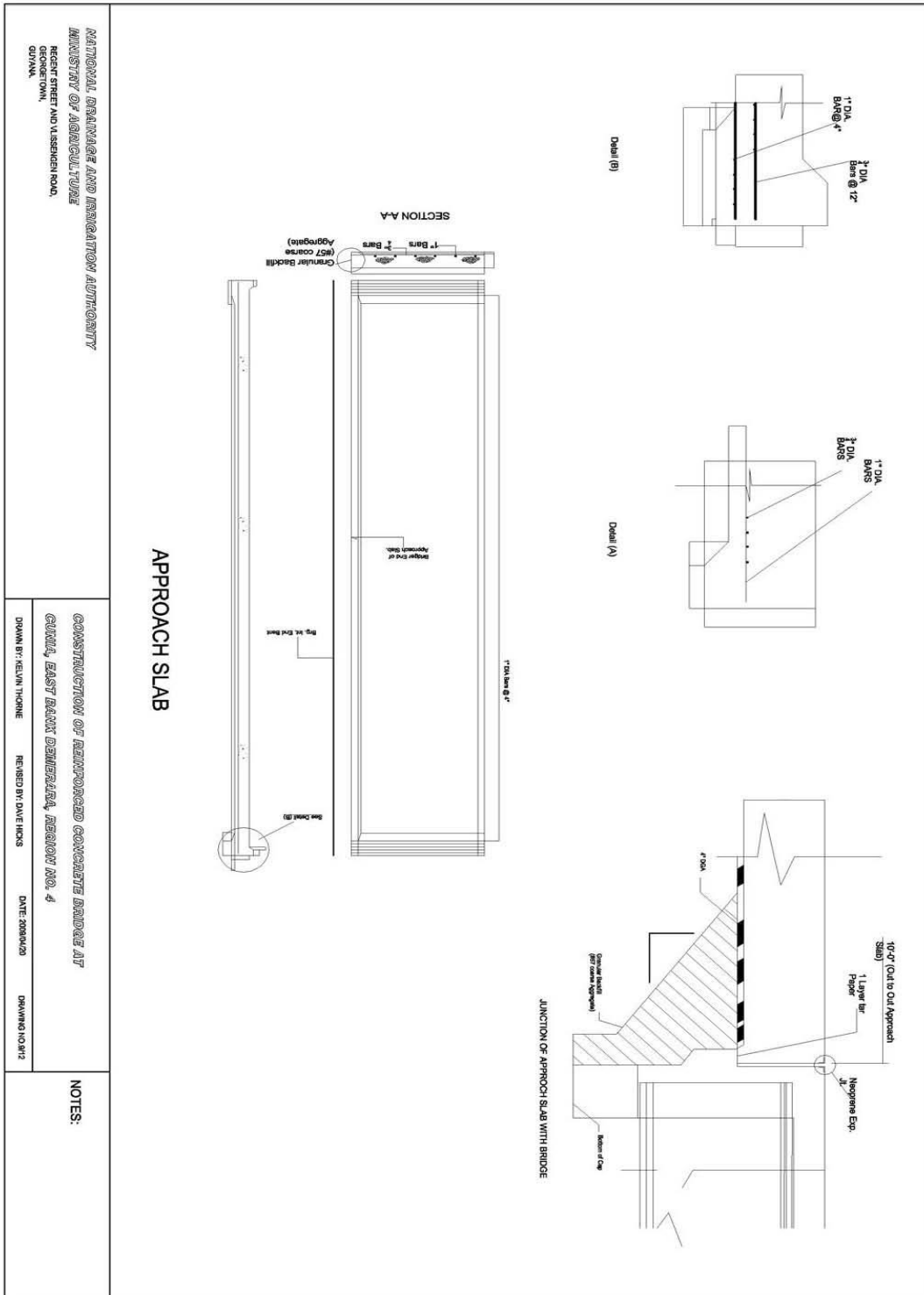
ABUTMENT WALLS

<p>NATIONAL PLANNING AND REGENERATION AUTHORITY MINISTRY OF AGRICULTURE REGENT STREET AND VASUBHAR ROAD, GURGAON, GUYANA.</p>	<p>CONSTRUCTION OF REINFORCED CONCRETE BRIDGE AT CUNHA, EAST BARTHELEMYA, REGION NO. 4 DRAWN BY: REJAYANTORNE REVISION BY: DAVE HICKS DATE: 2009/04/20 DRAWING NO: 2713</p>	<p>NOTES:</p>
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Bearing Detail



Approach Slab Detail

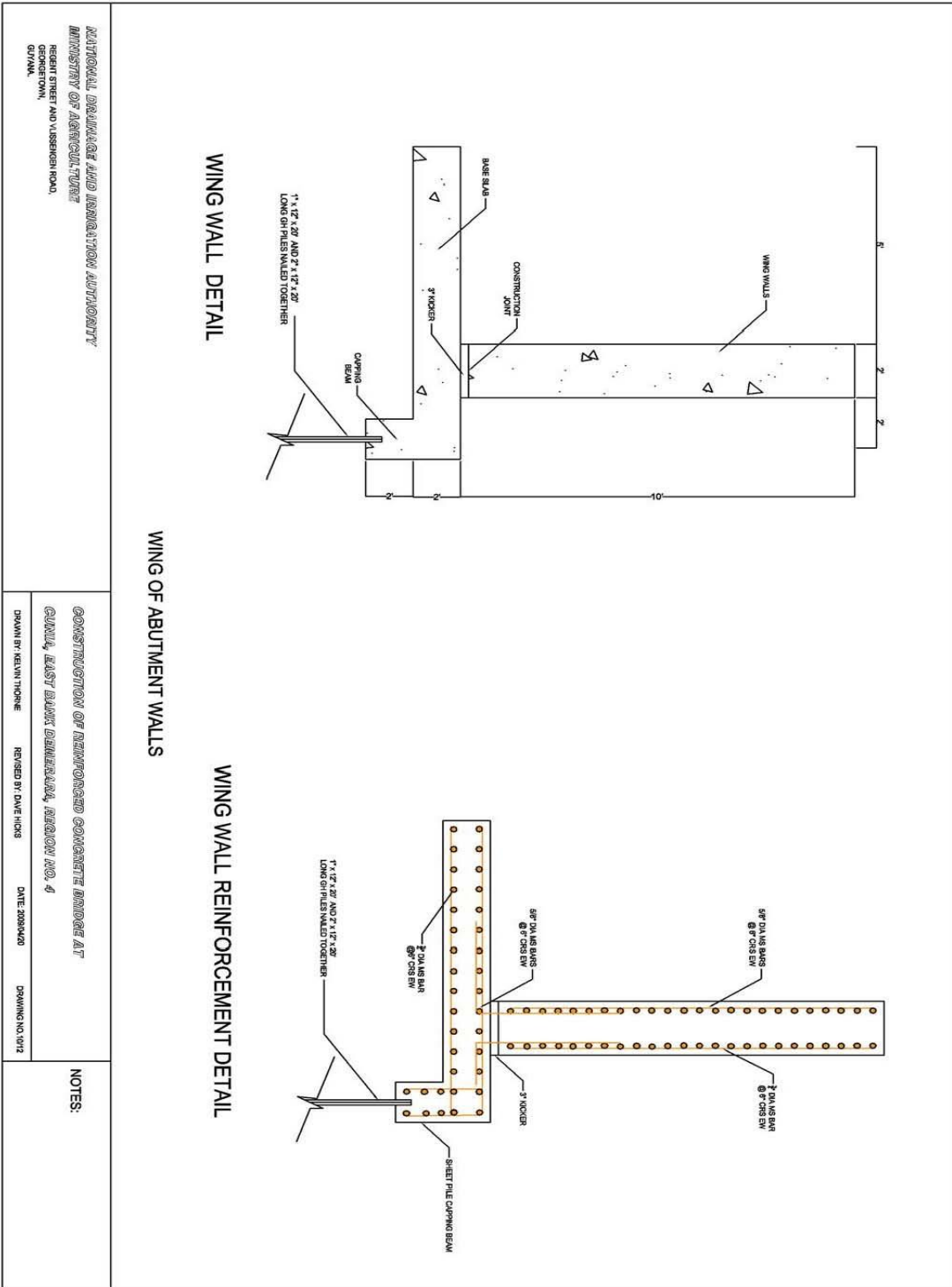


NATIONAL DRAINAGE AND REHABILITATION AUTHORITY
 MINISTRY OF AGRICULTURE
 ROBERT STREET AND LISBENGH ROAD,
 GEORGETOWN,
 GUYANA

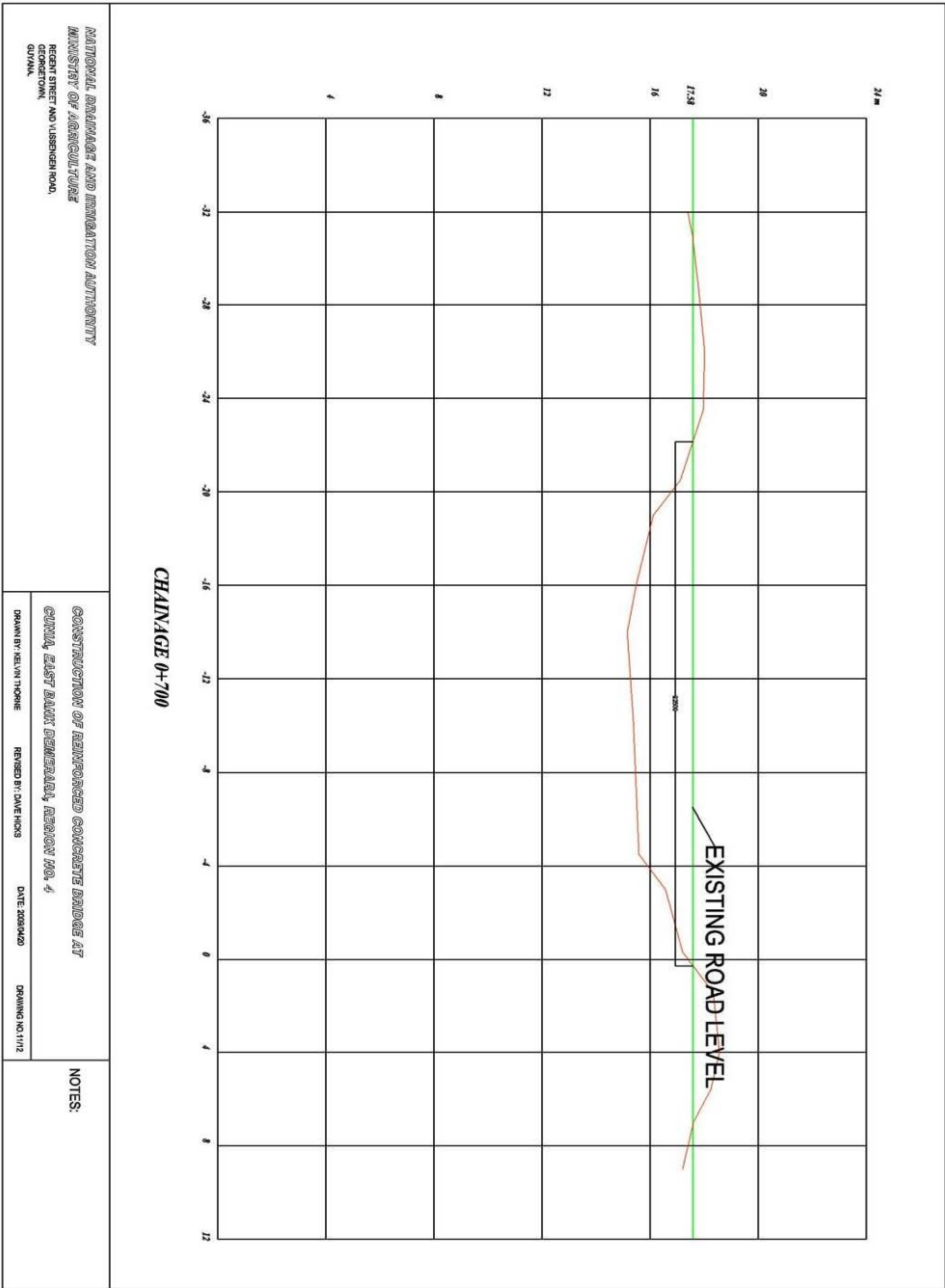
CONSTRUCTION OF REINFORCED CONCRETE BRIDGE AT
 CUNHA, EAST BANTU DEMERARA, REGION NO. 4
 DRAWN BY: MELVIN THORNE REVISED BY: DAVE HICKS DATE: 20/06/2015 DRAWING NO: 012

NOTES:

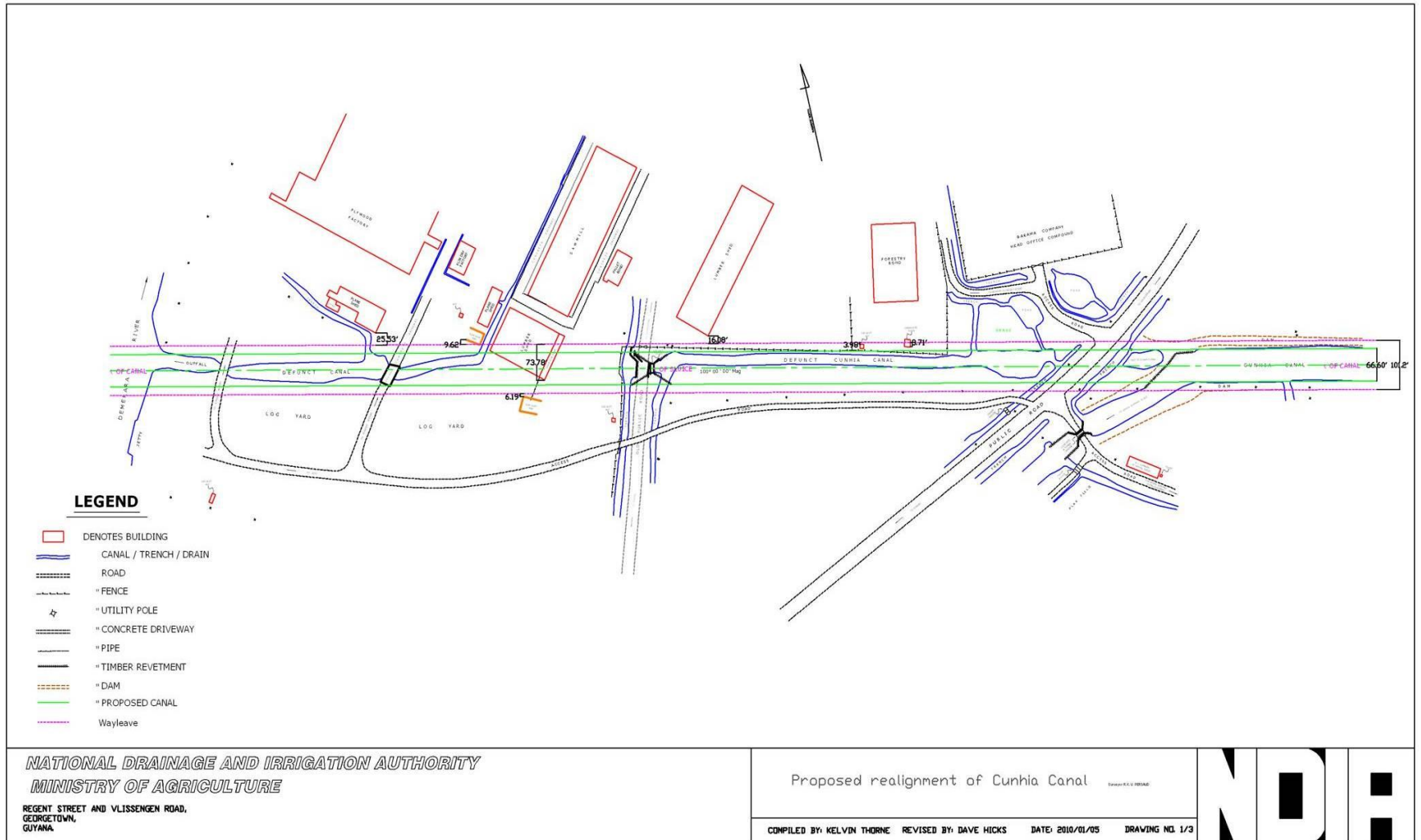
Wing Wall



Channel Section



Appendix F – Proposed Realignment of Cunha Canal



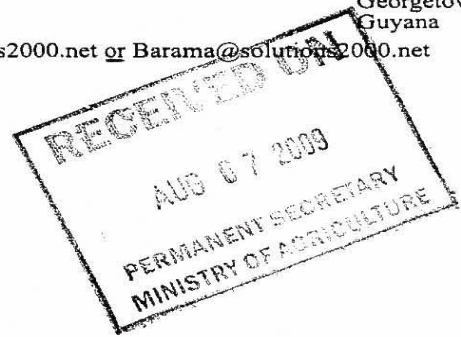
Appendix G – Letter of No Objection from Barama Company Limited dated August 06, 2009



BARAMA COMPANY LIMITED

Plywood & Sawn Lumber Complex
Land of Canaan, East Bank Demerara, Guyana South America.
Tel/Fax: 592-225-4555; Fax Mkt-225-8360; Accts - 225-4558
E-mail: mkt-barama@baramaguyana.com; mkt-barama@solutions2000.net or Barama@solutions2000.net

P.O. Box 10480
Georgetown,
Guyana



August 06, 2009

Mr. Dindyal Permaul
Permanent Secretary
Ministry of Agriculture
Regent & Vlissengen Road
Georgetown.

Dear Mr. Permaul,

Ref: Access to Canal Network

As earlier discussed and confirmed, Barama Company Limited gives permission to the National Drainage & Irrigation Authority, Ministry of Agriculture, to execute any work necessary to the canal network that flows into the Demerara River through our property.

Yours sincerely,

Peter Ho
C.E.O

Appendix H – Letter of No Objection from Barama Company Limited dated March 18, 2010



BARAMA COMPANY LIMITED

Plywood & Sawn Lumber Complex
Land of Canaan, East Bank Demerara, Guyana South America.
Tel.: 592-225-4555; Fax-Mkt: 592-266-5633; Accts: 592-266-5634; Procurement: 592-266-5635
Website: www.baramaguyana.com

P.O. Box 10480
Georgetown,
Guyana

March 18, 2010

Dr. Dindyal Permaul,
Permanent Secretary
Ministry of Agriculture
Regent and Vlissengen Road
Georgetown

Reference: No Objection for Rehabilitation of the Cunha Canal

Dear Dr. Permaul,

With reference to the subject at caption, we hereby inform you that we have reviewed the plans for the rehabilitation of the Cunha Canal and therefore issue our No Objection to the proposed alignment for the Canal which we recognize as pivotal for the drainage of the East Demerara Water Conservancy (EDWC).

We are cognizant that this would involve the relocation of infrastructures inclusive of a building. This will be facilitated by the Ministry of Agriculture and our Company. We are confident that there will be no serious disruption to our operations once properly coordinated.

Therefore, our Company commits to cooperate with your Ministry to ensure an efficient project implementation.

All for your information and guidance.

Best regards,

Peter Ho

CEO

"Concern for People, Environment & Quality"

Appendix I – Letter of No Objection from Work Services Group



WORKS SERVICES GROUP

MINISTRY OF PUBLIC WORKS & COMMUNICATIONS

Fort Street, Kingston, Georgetown, Guyana

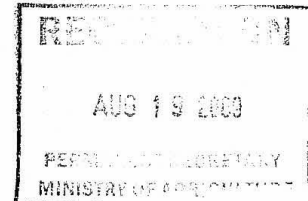
E-mail: wsg@gol.net.gy

Tel: 592-226-0650

Fax: 592-225-2689

August 13, 2009

Dr. Dindyal Permaul,
Permanent Secretary,
Ministry of Agriculture,
Regent and Vlissengen Road.



Dear Mr. Permaul,

CONSTRUCTION OF CUNIA BRIDGE

With reference to your email dated August 04, 2009, please be informed that we have reviewed the design for the above-mentioned bridge and offer our no objection.

Yours truly,

WORKS SERVICES GROUP
[Signature]
Ministry of Public Works
and Communications
Coordinator
E. SOUMAYAK

Appendix J – Memorandum of Understanding between MoA and MoPWC

MEMORANDUM OF UNDERSTANDING (MOU)

*GOVERNING THE DESIGN, CONSTRUCTION, SUPERVISION AND MAINTENANCE OF
PUBLIC ROAD BRIDGE ACROSS THE CUNHA RELIEF CHANNEL AT LAND OF CANAAN,
EAST BANK DEMERARA, GUYANA*

(hereinafter referred to as “the Project”)

Between

**THE MINISTRY OF AGRICULTURE (MOA)
REPRESENTED BY THE PERMANENT SECRETARY, MOA
of the one part**

And

**THE MINISTRY OF PUBLIC WORKS AND COMMUNICATION (MPW&C)
REPRESENTED BY THE PERMANENT SECRETARY, MPW&C
of the other part**

- WHEREAS:** The Co-operative Republic of Guyana (GOG) has entered into an agreement with the Department for International Development (DFID) for the receipt of a Grant to fund among other engineering works, the construction of a Public Road Bridge across the Cunha Relief Channel at Land of Canaan, East Bank Demerara
- WHEREAS:** The Grant will fund the rehabilitation of the Cunha Relief Channel and the currently defunct Cunha River Sluice to facilitate the discharge of excess water (approximately 500 cusecs) from the East Demerara Water Conservancy to the Demerara River
- WHEREAS:** The Project will be executed by the Agricultural Sector Development Unit of the MOA
- WHEREAS:** All public road bridges on the East Bank of Demerara fall under the jurisdiction of the MPW&C
- WHEREAS:** The MOA is desirous of meaningfully involving the MPW&C in the design, construction, supervision and maintenance (up to the issue of the Final Completion Certificate) of the Project
- WHEREAS:** The MOA is also desirous of handing over the ownership and maintenance of the Bridge to the MPW&C at the issue of the Final Completion Certificate for the Project

NOW IT IS HEREBY agreed as follows:

- ARTICLE 1:** The National Drainage and Irrigation Authority (NDIA) of the MOA shall design the Bridge and send draft copies of the Drawings, Bill of Quantities and any relevant computations for the written comments of the MPW&C and the documents shall be amended accordingly.
- ARTICLE 2:** The MOA shall prepare the Tender documents and obtain the written approval of the Permanent Secretary, MPW&C.
- ARTICLE 3:** The MOA shall be responsible for the issue of invitation for bids and the evaluation of tenders
- ARTICLE 4:** The MPW&C shall participate in all statutory site meetings and its comments shall duly be reflected in the minutes of the site meeting
- ARTICLE 5:** The MPW&C will visit the site at any time and as often as it deems necessary during the construction and defects liability periods.
- ARTICLE 6:** The MOA shall obtain the MPW&C's concurrence prior to the issue of any variation order
- ARTICLE 7:** The MPW&C shall indicate its satisfaction in the completed works by signing to this effect before the issue of the partial and final completion certificates to the contractor
- ARTICLE 8:** The MPW&C shall by letter from its Permanent Secretary to the Permanent Secretary, MOA, take over the ownership of the Bridge after the issue of the final completion certificate to the contractor

THE REPRESENTATIVES OF THE MINISTRY OF AGRICULTURE AND THE MINISTRY OF PUBLIC WORKS AND COMMUNICATION HEREBY AGREE TO THIS MOU

FOR THE MINISTRY OF AGRICULTURE

Dr. Dindyal Permaul
Permanent Secretary



SIGNATURE

22/6/09

DATE

FOR THE MINISTRY OF PUBLIC WORKS AND COMMUNICATION

Mr. Balraj Balram
Permanent Secretary



SIGNATURE

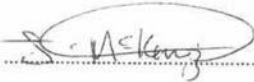
22/6/09

DATE

WITNESSES:

Joslyn McKenzie

NAME



SIGNATURE

22/06/09

DATE



NAME



SIGNATURE

24/06/09

DATE